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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 13
JULY 1, 1977

W77-06101 -- W77-06600

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

MULTIVARIATE EMPIRICAL TEST OF THE LEOPOLD AND MILLER STREAM ORDER-HYDRAULIC GEOMETRY HYPOTHESIS,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 2E.
W77-06315

MONSOON RAINS OVER WEST AFRICA,
Freie Universitat, Berlin (West Germany), Institut Fuer Meteorologie.
For primary bibliographic entry see Field 2B.
W77-06322

EFFECTS OF STREAM CHANNEL IMPROVEMENTS ON DOWNSTREAM FLOODS,
Kentucky Water Resources Research Inst., Lexington.
Y. H. Huang, and R. K. Gaynor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 667, Price codes: A09 in paper copy, A01 in microfiche. Research Report No. 102, January 1977. 182 p, 20 fig, 9 tab, 18 ref. OWRT B-042-KY(1), 14-31-0001-5076.

Descriptors: *Channel improvements, *Computer programs, Downstream, Floods, *Flood routing, Hydrographs, *Model studies, *Optimization, Rainfall-runoff relationships, Streamflow, Finite element analysis, *Kentucky, Simulation analysis, Watershed management.

A self-calibrating watershed model is presented for predicting the effect of channel improvements on downstream floods. The model is called MOPSET because it is a modified version of OPSET developed several years ago at the University of Kentucky. OPSET is a computerized procedure for determining an optimum set of parameter values by matching synthesized flows with recorded flows. Major modifications include the replacement of the modified Muskingum method of channel routing by a kinematic finite difference method, the division of the watershed into a number of segments, and the inclusion of a storage routing procedure to take care of any reservoirs or flood control structures located in the watershed. The computer program is well documented and can be used not only as a flood predicting model but also as a general model for hydrologic simulations. The model was applied to three different watersheds in Kentucky. It was found that the optimum set of parameter values obtained automatically by the model was not unique and might not yield the most desirable solution. For this reason, new features were added so that the user can exercise his judgement in selecting the most desirable parameter values. The synthesized flows obtained from these watersheds are presented and compared with the recorded flows. The effects of channel improvements, flood control structures, and routing procedures are discussed. (Huffsey-Kentucky)
W77-06397

2B. Precipitation

THE PASTORAL ZONE--REPRIEVED,
B. Lay.
Journal of Agriculture, South Australia, Vol. 79, No. 2, p 44-48, Winter, 1976.

Descriptors: *Droughts, *Rainfall, *Vegetation regrowth, *Rain, Arid lands, Precipitation(Atmospheric), Grazing, Pastures, Grasslands, Forage grasses, *Australia.

The pastoral zone of South Australia, subject to decades of drought but recently experiencing dramatic growth of vegetation, is discussed. One of the most important effects of good rains in the pastoral zone is subsequent ephemeral plant growth which relieves grazing pressure on the perennial forage plants. Of far greater long-term significance than this dramatic growth of short-lived plants has been the extensive regeneration in some areas of key perennial drought fodder plants. A problem associated with the rains is that rabbits have bred profusely in recent years, partly due to the abundance of feed. It is suggested that precaution be taken to protect the regeneration in this region that has occurred because of the rain. (Jamail-Arizona)
W77-06231

VARIATIONS IN RAINFALL AS A NATURAL CONSTRAINT ON AGRICULTURE,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage.
Y. Gustafsson.
Ambio, Vol. 6, No. 1, p 34-35, 1977, 2 fig, 1 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Arid lands, *Water supply, *Water shortage, *Water storage, Groundwater, Precipitation(Atmospheric), Foods, Semiarid climates, Variability, Droughts, Floods, Monsoons, Distribution patterns, Weather patterns, *Crop production.

The effect of rainfall variation on food production is discussed. In arid and semiarid regions food production is much less stable partially due to interannual variations in precipitation. A monsoon period with no rain can combine two regular dry periods into a period of one year's duration wholly without rainfall. Not only is rainfall distribution more irregular in these areas, but also natural water storage potential is often very limited. The problems posed by floods and subsequent soil erosion are also discussed. Because most developing countries are situated in arid and semiarid lands, they are usually the first to be affected by fluctuations in water resources. Measures to help balance water supplies include construction of dams and increased utilization of groundwater resources. It is also suggested that food production be increased to produce a surplus for use when rainfall is insufficient. International aid to regions suffering from shortages is also discussed. (Jamail-Arizona)
W77-06240

PROLONGED DRY SPELLS AT BELLARY DURING THE SOUTHWEST MONSOON SEASON,
University of Agricultural Sciences, Bangalore (India).
B. V. Ramana Rao, R. V. Ramamohan, and P. S. Kavi.
Annals of Arid Zone, Vol. 15, No. 1 and 2, p 29-36, March and June, 1976, 1 fig, 4 tab, 3 ref.

Descriptors: *Monsoons, *Rainfall disposition, *Distribution patterns, *Droughts, *Frequency analysis, Meteorology, Precipitation(Atmospheric), Rainfall, Rain, Weather patterns.
Identifiers: *Bellary(India).

A study was conducted to determine the occurrence of prolonged dry spells during the southwest monsoon at Bellary, India. Daily rainfall data recorded at the meteorological observatory in Bellary for the years 1921-1970 were analyzed to study these dry periods. Average monthly rainfall was calculated for different months, and frequencies of dry spells of different lengths from June to September computed. Any day with rainfall of less than one millimeter is considered a dry day. The results are presented. Dry spells of seven days or more are likely to occur on the average of five times during the monsoon season. Dry spells of 14 days or more are likely to occur twice each season, while dry spells of 30 days or more during the monsoon occur once every five years. The chances of having a prolonged dry spell seems to be the same throughout the monsoon season, although average rainfall during the months of August and September is almost double that for the months of June and July. It is calculated that in 21 of the 50 years studied there was drough, 3 dry spells of 14 days or more within the same monsoon season. (Jamail-Arizona)
W77-06242

DEGREE OF PRECIPITATION IRREGULARITY AS AN INDICATION OF LANDSCAPE ZONALITY,
Ts. A. Shver.
Soviet Hydrology, Selected Papers, No. 3, p 159-164, 1975. 2 fig, 4 tab, 6 ref. Translated from Trudy Glavnoi Geofizicheskoi Observatorii Imeni A.I. Voeikova, No. 341, p 87-96, 1975.

Descriptors: *Precipitation(Atmospheric), *Probable maximum precipitation, *Distribution patterns, Rainfall, Spatial distribution, Monthly, Foreign research, Annual, Analytical techniques, Data processing, Climatology, Meteorology, Landscaping.
Identifiers: *Precipitation irregularity, *USSR, Landscape zonality.

A method of analysis of the monthly precipitation in the Soviet Union was described. The results of this analysis were discussed. It was found that in those regions where the precipitation maximum is distinct, which is typical over a large part of the Soviet Union, the concentration of precipitation makes it possible to determine the precipitation maximum to within 10 days. Where the observed maximum is defined poorly and extends over several successive months, the computed and observed maxima do not agree. The concentration of precipitation may fall on any of the months of the given season. When there is a secondary observed maximum, precipitation concentration (the 10-day period of the computed maximum) falls in a month close to the primary maximum. After corrections were introduced to the measured precipitation totals, the area of regions where precipitation is concentrated in the winter has increased. The boundary of the zone with a Mediterranean type of annual precipitation pattern has shifted northward and eastward. The precipitation maximum has shifted to the winter months in the Volga region to Kuybyshev and over the entire Caspian lowland. The degree of precipitation irregularity, as a numerical index of the uniformity of the annual pattern, permits not only usual mapping, but also application of statistical methods for computing, for example, the probabilities of various characteristics, and analysis of cyclic fluctuations, of the secular pattern, and of the correlation of the annual pattern in various climatic regions. (Sims-ISWS)
W77-06307

HILLSLOPE FORM AND CLIMATE,
Denver Univ., Colo. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-06314

MONSOON RAINS OVER WEST AFRICA,
Freie Universitat, Berlin (West Germany), Institut Fuer Meteorologie.
G-D. Schupelius.
Tellus, Vol. 28, No. 6, p 533-537, 1976. 5 fig, 11 ref

Descriptors: *Monsoons, *Africa, *Atlantic Ocean, Rainfall, Tropical regions, Seasonal, Pressure, Precipitation(Atmospheric), Correlation analysis.
Identifiers: Barometric pressure, Tropospheric temperature, Rawinsondes, *West Africa.

Potential mechanisms producing high or low seasonal rainfall in tropical West Africa were investigated for the period 1963-74, using monthly data of precipitation; surface pressure in the South Atlantic; and rawinsondes, mainly in Africa. Variations in the yield of the seasonal rains had let to a drought period in the Sahel Zone in the early 1970's. As severe a drought had not been experienced within at least 20 years. In previous studies, quantities such as the departure of the Intertropical Convergence Zone position had been investigated, as had the inclination of the zone with height, sterring through the adjoining subtropical high pressure centers and relations with the general atmospheric circulation. Contrary to widespread opinion, the South Atlantic pressures yielded no correlation; the best connection was between rainfall and upper-level African observations. (Roberts-ISWS)
W77-06322

ANNUAL AMOUNT OF PRECIPITATION IN THE USSR, ACCORDING TO CORRECTED DATA,
Ts. A. Shver.
Soviet Hydrology, Selected papers, No. 3, p 155-159, 1975. 1 fig, 15 ref. Translated from Transactions of the Voyeyekov Main Geophysical Observatory (Trudy GGO), No. 341, p 57-64, 1975.

Descriptors: *Precipitation(Atmospheric), *Data collections, *Foreign countries, Maps, Isohyets, Annual, Meteorological data, Hydrological data, Areal.
Identifiers: *USSR.

A new annual map of corrected precipitation totals for the USSR was presented. Its working copy is on a scale of 1:7,500,000; and for the mountain regions of the Caucasus, the Crimea, the Carpatians, Soviet Central Asia, the Altay and Sayan, it is on a scale of 1:3,500,000, i.e., of a sufficiently large scale for using the data of almost the entire precipitation network of the USSR totalling 10,821 stations. In compiling the map, corrections were introduced into normal precipitation for losses through evaporation. No correction was made for snow blown into the precipitation gage. The scale of the map is sufficient for it to be used for general climatic purposes to estimate the precipitation regime, but the scale is insufficient for identifying some features associated with the effect of the underlying surface. (Humphreys-ISWS)
W77-06508

THE POLARIZATION CHARACTERISTICS OF LIDAR SCATTERING FROM SNOW AND ICE CRYSTALS IN THE ATMOSPHERE,
York Univ., Downview (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-06512

REMOTE SENSING OF THE THICKNESS AND COMPOSITION OF CIRRUS CLOUDS FROM SATELLITES,
Utah Univ., Salt Lake City. Dept. of Meteorology.
K-N. Liou.
Journal of Applied Meteorology, Vol. 16, No. 1, p 91-99, January 1977. 6 fig, 2 tab, 13 ref. Air Force F19628-75-C-0107.

Descriptors: *Remote sensing, *Clouds, *Satellites(Artificial), Atmosphere, Ice, Crystals, Water vapor, Numerical analysis, Radiation, Infrared radiation, Meteorology.
Identifiers: *Cirrus clouds, Ice crystals, Error analysis.

A retrieval technique was presented for the determination of the surface temperature, the thickness and transmissivity of cirrus clouds, and the fraction of the cirrus cloudiness by means of four observed upwelling radiances in the 10 micrometer window region. On the basis of radiative transfer calculations for mean wavenumbers of 900, 950, 1100, and 1150 per cm, assumptions were made in the theoretical retrieval analyses that water vapor effects above cirrus clouds are negligible and that ratios of the transmissivities are linear functions of the cloud thickness. Error analyses employing climatological data revealed that independent random errors in temperature and humidity profiles introduce insignificant errors in the four resulting parameters. The resulting errors caused by random errors in the expected upwelling radiances, however, depend upon their standard deviations. It was illustrated that once the thickness and the transmissivity at a given wave number of a cirrus cloud have been determined, the vertical ice content may be estimated, assuming that ice particles are randomly oriented in a horizontal plane. (Sims-ISWS)
W77-06513

2C. Snow, Ice, and Frost

PRESENCE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) IN ARCTIC AND SUBARCTIC MARINE FOOD CHAINS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemicals Section.
For primary bibliographic entry see Field 5B.
W77-06266

SOME PATTERNS IN THE MICROSTRUCTURE OF THE SNOW-DEPTH FIELD IN THE MOUNTAIN REGIONS,
A. A. Chrikova.
Soviet Hydrology, Selected Papers, No. 3, p 126-132, 1975. 2 fig, 4 tab, 24 ref. Translated from Trudy SARNIGMI (Transaction of the Regional Central Asian Hydrometeorological Scientific Research Institute), No. 25 (106), p 154-167, 1975.

Descriptors: *Snow surveys, *Snowpacks, *Correlation analysis, Snow, Snowcover, *Depth, Density, Meltwater, Snowmelt, Water equivalent, Surveys, Foreign research, Measurement, Mountains, Snowfall, Statistics, Statistical methods, Analytical techniques.
Identifiers: *USSR.

Snow depths were measured along strictly fixed courses 50 m long. Measurements in areas 1-6 were made along four intersecting lines; and in the other areas, measurements were made along the perimeter of a square. Snow depth was measured with a portable staff with a scale of 1 cm. In all, 28 series of snow surveys were performed in 1967, 1971, and 1972. The results of these measurements were used to compute and construct the correlation functions of relative differences in elevation. Their comparison with the snow depth functions showed then to be similar in most cases. From this analysis, several conclusions were derived regarding the organization of snow depth measurements at snow stations. In selecting the interval of snow depth measurements, one must allow for the dissection of the area and snow depth. The thicker the snow, the greater is the distance at which the correlation attenuates, i.e., the greater the effective distance. When the normal climatic snow depth is unknown, the effective distance can be determined by computing the correlation function of relative differences in elevation from an earlier topographic survey of the area of the snow station. The question of the optimum number of measurements at a snow station remains open. However, these results show that this number must differ in different snow accumulation periods owing to differences in the statistical structure of the field and differences in the error of determination of average snow depth over the area. Considering that the conditions of homogeneity and isotropy of the snow depth field are very approximate, the snow courses must run in the horizontal and vertical directions of the slope. (Sims-ISWS)
W77-06302

ANALYSIS OF SNOW TEMPERATURE MEASUREMENTS (BASED ON DATA FOR THE WESTERN TIEN-SHAN),
L. A. Kaneyev.
Soviet Hydrology, Selected Papers, No. 3, p 132-135, 1975. 2 fig, 3 tab, 10 ref. Translated from Trudy SARNIGMI (Transactions of the Central Asian Regional Hydrometeorological Scientific Research Institute), No. 25 (106), p 176-183, 1975.

Descriptors: *Snow, *Temperature, *Measurement, *Correlation analysis, *Asia, Measurement, Surveys, Data collections, Data processing, Analytical techniques, Snowpacks, Depth, Instrumentation, Foreign research, Thermometers.
Identifiers: *Snow temperature, *USSR.

The snow temperature observations made from 1970 to 1973 in the basins of the Dukant, Naugarzan, and Kyzylcha rivers made it possible to establish the optimum number of measurements necessary for computing the average daily snow temperature at various levels. All the observational data were grouped according to different characteristics (thermometer depth), and the average daily snow temperatures were computed from 4 and 8 observations a day. The relations between these values were linear. The closeness of the relation of these values indicates that 4 observations a day are sufficient for computing the average daily snow temperature, regardless of what time these observations are made. The relations between the temperatures of the various layers were fairly reliable for all observation periods. Their closeness, given by the correlation coefficients, decreases as the internal between temperature measurements increases. The study lead to the following conclusion: (1) Snow temperature measurements can be made four instead of eight times a day. The measurements should be performed strictly at the same times and the same depths at the avalanche stations of Soviet Central Asia. (2) An interrelation between temperatures at various depths in the snow can be determined, making it possible to establish, by means of computed regression equations, the temperature at the desired depths from the temperature measured in one of the upper snow layers. (3) It is possible to compute the structural time function of temperature in the upper layers of dry snow. (Sims-ISWS)
W77-06303

SNOW AND ICE PENITENTS, THEIR FORMATION MECHANISM AND INDICATIVE IMPORTANCE,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
V. M. Kotlyakov, and I. M. Lebedeva.
Soviet Hydrology, Selected Papers, No. 3, p 135-141, 1975. 6 fig, 3 tab, 8 ref. Translated from Izvestiya Akademii Nauk SSR, Seria Geograficheskaia, No. 3, p 26-36, 1975.

Descriptors: *Snow, *Ice, *Glaciers, Melting, Solar radiation, Temperature, Air temperature, Weather, Foreign research, Precipitation(Atmospheric), Snowfall, Circulation, Air circulation, Evaporation, Mountains, On-site investigations.
Identifiers: *Snow and ice penitents, *Ice formations, *USSR.

Heat budget observations made during the period 1969-1973 on the glaciers and snow fields of the Eastern Pamir showed that penitents are a special form of selective snow and ice melting. The selective melting takes place in sunny, dry, and moderately cold weather and results in negative values of net long-wave radiation and heat expenditures on evaporation. Melting occurs from an excess of heat only on surfaces perpendicular to the sun at the highest solar elevation. These conditions are found at various absolute elevations, depending on latitude; but the zone of development of the penitents varies considerably with elevation and also during the ablation period because of the

year-to-year variations in circulation processes. (Sims-ISWS)
W77-06304

NATURAL CONTAMINATION OF THE FIRN-ICE LAYER OF THE ABRAMOV GLACIER, ACCORDING TO CORE DRILLING,
B. V. Kislov, and J. K. Nozdryukhin.
Soviet Hydrology, Selected Papers, No. 3, p 175-178, 1975. 2 fig, 6 ref. Translated from Trudy SARNIGMI (Translations of the Central Asian Regional Hydro-Meteorological Scientific Research Institute), No. 27 (108), p 86-93, 1975.

Descriptors: *Glaciers, *Dusts, *Core logging, *Core drilling, Ice, Foreign research, Snow, Firn, Analytical techniques, Precipitation(Atmospheric), Snowpacks, Cold regions, Climatology, Glaciology.
Identifiers: *Abramov Glacier(USSR), *USSR, Dust layers, Natural contamination, Firn-ice layers.

Continuous cores were drilled with an electric drill to a depth of 50 m 73 cm in September 1973 at an elevation of 4400 m in the firn zone of the Abramov Glacier. In all, 47 continuous cores, averaging 83.2 mm in diameter, were obtained. From these cores, 202 firn and ice samples were selected to study natural contamination; and 11 samples were seleced for spectral analysis by elements. The core was sawed into individual blocks, which were placed in double polyethylene bags or jars and transported to the glaciological bases where they were melted at room temperature. The thickness of the snow-firn layer with ice interlayers at an elevation of 4400 m in the alimentation area of the Abramov Glacier is 20-22 m. Determination of the annual layers of the firn-ice layer by combined application of the visual method and of the average dust concentration vs depth graph can give a good approximation to the actual age of the deposits. The average dust concentrations obtained for the six types of firn and ice identified are: (1) 212.6 g/cu m for every dirty ice; (2) 93.0 g/cu m for dirty ice; (3) 35.8 g/cu m for firn ice; (4) 31.2 g/cu m gor for firn; (5) 30.6 g/cu m for dull, bubbly opaque ice; and (6) for the alternation of layers of semitransparent and transparent, pale blue semitransparent, and blue transaxent ice. The amount of dust falling on the Abramov Glacier from the atmosphere has fluctuated considerably from year to year in the last 50 years. (Sims-ISWS)
W77-06308

METHOD FOR CONSTRUCTING AN ICE PLATFORM,
Sun Oil Co., Dallas, Tex. (Assignee).
For primary bibliographic entry see Field 3E.
W77-06451

EFFECT OF CRYOGENIC PROCESSES ON THE FORMATION OF SODIUM BICARBONATE WATERS,
Irkutskii Gosudarstvennyi Universitet (USSR).
For primary bibliographic entry see Field 2K.
W77-06507

EXPERIMENTAL COMPUTATION OF THE MELTWATER VOLUME FROM THE SURFACE OF GLACIERS,
M. V. Volkova, A. A. Kreyter, and A. A. Tikhanovskaya.
Soviet Hydrology, Selected Papers, No. 3, p 165-169, 1975. 1 fig, 5 tab, 5 ref. Translated from Transactions of the Central Asian Regional Hydrometeorological Scientific Research Institute (Trudy SARNIGMI), No. 27 (108), p 54-61, 1975.

Descriptors: *Glaciers, *Melt water, *Discharge(Water), *Foreign countries, Glaciation, Snow cover, Glacial drift, Firn, Areal, Data collections, Evaluation, Runoff, Water sources, River basins, Volume, Melting.
Identifiers: *USSR, *Pskem River, *Chatkal River.

The surface melting of a glacier is determined by its geographic location, morphological characteristics, state of the active surface, and weather conditions in a given period. The first three conditions are individual for each glacier, while the fourth is common for an entire region and may be described by the temperature of the air mass that determines the weather in it at a given instant of time. Meltwater volume computations were performed for the Ayutor-2 (August 1969 and 1970) and Ayutor-3 (August 1970) glaciers. These glaciers were selected as controls since hydrologic observations were performed during these periods in the vicinity of their tongues. The computed meltwater volumes, which were from 10.5 to 11.5% less than the measured runoff volume, were considered to be in satisfactory agreement. Therefore, the meltwater volumes from the surface of glaciers in the Pskem and Chatkal river basins were computed. It was found that: (1) the proportion of the meltwater volume of each of the basins in the total meltwater volume is close to the proportion of the glaciated area of a given basin in the total glaciated area; (2) a snow cover on the glaciers (from the head to the firn line) reduces the meltwater volume by 16% of the possible value in the absence of snow in the Pskem basin, and by 17% in the Chatkal basin; and (3) the decrease in melting under the effect of the moraine cover amounts to 8.5% of possible melting in the absence of a moraine in the Pskem basin, and to 2.4% in the Chatkal basin. (Humphreys-ISWS)
W77-06509

HYDROCHEMICAL DESCRIPTION OF THE GLACIERS OF THE CHIRCHIK RIVER BASIN,
L. F. Kamalov.
Soviet Hydrology, Selected Papers, No. 3, p 170-174, 1975. 2 fig, 6 tab, 8 ref. Translated from Transactions of the Central Asian Regional Hydrometeorological Scientific Research Institute (Trudy SARNIGMI), No. 27 (108), p 76-85, 1975.

Descriptors: *Glaciers, *Chemical properties, *Surveys, *Foreign countries, Foreign research, Sampling, Ice, Snow, River basins, Water quality, Melt water, Data collections, Evaluation, Precipitation(Atmospheric), On-site investigations, Sampling, Dissolved solids, Salts.
Identifiers: *USSR, *Chirchik River.

Some of the results of field investigations of glaciers in the upper part of the Chirchik River basin (Western Tien-Shan) from 1970 to 1973 were reported. The following work was performed on the glaciers: (1) precipitation was sampled; (2) ice and snow samples were taken in various parts of the glaciers; (3) meltwater was sampled; (4) river water was sampled; and (5) experiments were performed to determine the effect of the moraine cover on the change in the chemistry of snow and ice. Precipitation is the primary source of external salt supply to glaciers. The concentration of water-soluble ions decreased with elevation in liquid precipitation and increased in solid precipitation. The mineral content of atmospheric water averaged 60 mg/l in rainwater, and 46 mg/l in snow water. The content of water-soluble salts in the seasonal snow cover varied from 72 to 140 mg/l. The mineral content of the snow meltwater filtering through limestone increased from 16 to 60 mg/l, although the mineral content of the meltwater filtering through granites remained nearly unchanged, increasing from 16 to 18 mg/l. It was concluded that the glacier basin of the Chirchik River is a zone of the interaction with rocks of snow and glacier meltwaters. Calcium, magnesium, sodium, and potassium ions are intensively leached in this hypergenic zone. Fresh bicarbonate waters form. (Humphreys-ISWS)
W77-06510

HEAT BALANCE IN THE ABLATION AREA OF THE AMPERE GLACIER (KERGUELEN ISLANDS),
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
A. Poggi.
Journal of Applied Meteorology, Vol. 16, No. 1, p 48-55, January 1977. 8 fig, 6 tab, 30 ref.

Descriptors: *Glaciers, *Ablation, *Heat balance, Model studies, Mathematical models, On-site investigations, On-site data collections, Winds, Temperature, Vapor pressure, Humidity, Solar radiation, Melting, Ice, Radiation, Thermal radiation, Weather, Measurement, Glaciology.
Identifiers: *Ampere Glacier, *Kerguelen Islands.

The heat balance at the surface of the Ampere Glacier (69 deg E, 49 deg S) was studied from 8 January to 2 March 1972. The validity of the logarithmic model was verified up to a height of 3 m for wind speed and 2 m for temperature. The energy conservation equation in the heat exchange layer was verified to 2%. On an average, net radiation is responsible for 58% of the melting. However, during periods when turbulence is particularly high, the eddy fluxes of sensible heat and latent heat are responsible for 56% of the melting. The ocean environment manifests itself by fluxes of latent heat which are generally directed toward the surface. (Sims-ISWS)
W77-06511

THE POLARIZATION CHARACTERISTICS OF LIDAR SCATTERING FROM SNOW AND ICE CRYSTALS IN THE ATMOSPHERE,
York Univ., Downview (Ontario). Dept. of Physics.
S. R. Pal, and A. I. Carswell.
Journal of Applied Meteorology, Vol. 16, No. 1, p 70-80, January 1977. 16 fig, 14 ref.

Descriptors: *Remote sensing, *Snow, *Crystals, *Atmosphere, Ice, Clouds, Precipitation(Atmospheric), Cloud physics, Light, Meteorology.
Identifiers: *Lidar, Ice crystals, Cirrus clouds, Polarization, Scattering, Backscatter.

The effects of ice crystals on the backscatter polarization in lidar returns were measured. Scattering from ground-level snow of varying density, high-altitude cirrus clouds, and ice pellet shower clouds was studied using a linearly polarized ruby laser system with multiple receiver channels. The space and time dependence of the total intensity and the linear depolarization ratio of the lidar return were investigated. It was found that considerable variations occur in snow with the linear depolarization ratio varying between 0.2 and 0.8. In cirrus and ice pellet shower clouds, the linear depolarization ratio is typically found to lie in the range from 0.2 to 0.4. The factors involved in the use of polarization data for ice-water discrimination in the atmosphere were presented and discussed. (Sims-ISWS)
W77-06512

REMOTE SENSING OF THE THICKNESS AND COMPOSITION OF CIRRUS CLOUDS FROM SATELLITES,
Utah Univ., Salt Lake City. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W77-06513

USE OF SIDE-LOOKING AIRBORNE RADAR TO DETERMINE LAKE DEPTH ON THE ALASKAN NORTH SLOPE,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.
For primary bibliographic entry see Field 2H.
W77-06526

AN OPERATIONAL ALL-WEATHER GREAT LAKES ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. T. Gedney, R. J. Schertler, R. A. Mueller, R. J. Jirberg, and H. Mark.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-10605, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum X-71812, 1975. 11 p, 6 fig, 6 ref.

Descriptors: *Lake ice, *Great Lakes, *Remote sensing, *Warning systems, Aircraft, Radar, Instrumentation, Data transmission, Ice cover, Ice, Satellites(Artificial), Navigation, Ships, Winter, Surveys.
Identifiers: *Side looking airborne radar, Ice thickness.

An all-weather ice information system was developed by the NASA Lewis Research Center. The system utilizes and X-band Side-Looking-Airborne-Radar (SLAR) for determining type, location, and areal distribution of the ice cover in the Great Lakes and an airborne, S-band, down-looking short pulse radar for obtaining ice thickness. The SLAR system is currently mounted aboard a Coast Guard C-130B aircraft. Digitized SLAR data is relayed in real time via the NOAA-GOES satellite in geosynchronous orbit to the Coast Guard Ice Center in Cleveland, Ohio. SLAR images, along with hand-drawn interpretative ice charts from various winter shipping areas in the Great Lakes, are broadcast to facsimile recorders aboard Great Lakes vessels via the MARAD marine VHF-FM radio network to assist such vessels in navigating both through and around theice. The results from the 1974-1975 season demonstrated that the system is capable of providing near real time all-weather ice information which vessels can use to reduce costly delys and hazards associated with winter navigation. (Sims-ISWS)
W77-06527

GREAT LAKES ALL-WEATHER ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. J. Schertler, R. A. Mueller, R. J. Jirberg, D. W. Cooper, and J. E. Heighway.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-33481, Price codes: A03 in paper copy, A01 in microfiche. Technical Memorandum X-71815, 1975. 29 p, 15 fig, 1 tab, 10 ref.

Descriptors: *Lake ice, *Great Lakes, *Remote sensing, *Warning systems, Aircraft, Radar, Instrumentation, Data transmission, Ice cover, Ice, Satellites(Artificial), Navigation, Ships, Winter, Surveys.
Identifiers: *Side looking airborne radar, Ice thickness.

An all-weather ice information system developed by the NASA Lewis Research Center was described. This system utilizes and X-band Side-Looking-Airborne-Radar (SLAR)for determing type, location, and aerial distribution of the ice cover in the Great Lakes and an airborne, S-band, short radar for obtaining ice thickness. The SLAR system is currently mounted aboard a Coast Guard C-130B aircraft. Digitized SLAR data are relayed in real time via the NOAS-GOES-1 satellite in geosynchronous orbit to the Coast Guard Ice Center in Cleveland, Ohio. SLAR images, along with handdrawn interpretative ice charts for various winter shipping areas in the Great Lakes, are broadcast to facsimile recorders aboard Great Lakes vessels via the MARAD marine VHF-FM radio network to assist such vessels in navigating both through and around the ice. The operational aspects of this Ice Information System are being demonstrated by NASA, Coast Guard, and NOAA/National Weather Service. Result from the 1974-75 winter season demonstrated the ability of this system to provide all-weather ice information to shippers in a timely manner. (Sims-ISWS)
W77-06528

EXPERIENCE IN CONSTRUCTION OF A FROZEN-TYPE DAM IN YAKUTIYA,
For primary bibliographic entry see Field 8A.
W77-06529

2D. Evaporation and Transpiration

WATER REGIME OF CENTRAL ASIAN DESERT PLANTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
V. M. Sveshnikova.
Ekologiya 6(5), p 35-42, 1975.

Descriptors: *Transpiration, *Desert plants, Deserts, Sands, Seasonal.
Identifiers: Acantholimon-diapensioides, Aellenia-subaphylla, Ammodendron-conollyi, Artemisia-rhodantha, Calligonum-caput, Calligonum-grizeum, Calligonum-microcarpum, Carex-physodes, Ceratoides-papposa, Halocharis-hispida, Haloxylon-ammodendron, Haloxylon-persicum, Rheum-turkestanicum, Salsola-richteri, Salsola-rigida, Smirnova-turkestana, Stipa-glareosa, Zygophyllum-goncharovii, Kara-Kum desert(USSR), Tadzhik SSR, *Eremophytes.

Long-term investigations were made of the water regime of plants of the sandy Kara-Kum desert, sandy desert lands of southern Tadzhik SSR (USSR), and high-mountain deserts of Pamir. Two widespread groups of species were studied. The 1st group included plants with intense growth and development confined to spring and early summer: Calligonum grizeum, C. microcarpum, Zygophyllum goncharovii, Smirnova turkestana, Rheum turkestanicum, Carex physodes and Calligonum caput. The 2 nd group (true eremophytes) with a long continuous period of begetation included: Haloxylon persicum, Aellenia subaphylla, Halocharis hispida, Salsola rigida, Haloxylon ammodendron, Salsola richteri and Ammodendron conollyi. The dominant species of the high-mountain deserts of Pamir were Ceratoides papposa, Artemisia rhodantha, Acantholimon diapensioides and Stipa glareosa. Transpiration water loss in typical eremophytes is most stable and moderate; it is high in herbaceous plants. Low values of water deficit, rarely reaching critical values, were found for the investigated species.--Copyright 1976, Biological Abstracts, Inc.
W77-06150

FIELD WATER BALANCE AND SIMULATED WATER RELATIONS OF PRAIRIE AND OAK-HICKORY VEGETATION ON DECIDUOUS FOREST SOILS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2G.
W77-06325

HEAT BALANCE IN THE ABLATION AREA OF THE AMPERE GLACIER (KERGUELEN ISLANDS),
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
For primary bibliographic entry see Field 2C.
W77-06511

SEASONAL AND WAVELENGTH DEPENDENCE OF URBAN/RURAL RADIANCE IN IOWA,
Iowa State Univ., Ames. Dept. of Aerospace Engineering; and Brooks, Borg and Skiles, Des Moines, Iowa.
For primary bibliographic entry see Field 7B.
W77-06514

INVESTIGATIONS ON THE HUMIDITY AND INFILTRATION RELATIONS IN SOILS WITH DIFFERENT SUBSOIL WATER CONDITIONS WITH AND WITHOUT CROPS, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Meteorologie und Klimatologie.
For primary bibliographic entry see Field 2G.
W77-06541

2E. Streamflow and Runoff

RUNOFF POTENTIAL OF DESERT CATCHMENTS IN BIKANER DISTRICT,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4B.
W77-06246

INDIRECT ESTIMATION OF HYDROLOGIC PARAMETERS,
Idrotecneco, Rome (Italy). Data and Systems Analysis Group.
L. Torelli, and P. Tomasi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY2, Proceedings Paper 12746, p 169-180, February 1977. 9 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Statistical models, *Geomorphology, *Simulation analysis, *Hydrology, *Time series analysis, Rivers, Drainage area, Regression analysis, Synthetic hydrology, Hydrologic data, Infiltration, Foreign countries, Foreign research, *Estimating.
Identifiers: *River Po, *Italy, Statistical tests, Covariance.

For generating synthetic multiple series of monthly streamflows, it is necessary to evaluate the parameters describing their probability structure. The statistical hydrologic parameters of monthly streamflow series were correlated with geomorphologic characteristics of river basins so that synthetic multiple series could be generated at ungaged sites. The study was based on the analysis of river data for the Emilia-Romagna region in Italy, mostly including the right side tributaries of the River Po. The two geomorphological parameters used in correlations were the drainage area and the height above the mean sea level. Validation of the methodology was made through reconstruction of some observed historical series by a multivariate technique. The reconstruction was made by using both the parameter values obtained from the geomorphological information and the estimate from observed data. The two reconstructions were then compared. (Singh-ISWS)
W77-06300

PROPERTIES OF CHANNEL WANDERING,
V. V. Romashin.
Soviet Hydrology, Selected Papers, No. 3, p 142-146, 1975. 3 fig, 2 tab, 2 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 225, p 5-15, 1975.

Descriptors: *Channel morphology, *Meanders, *Alluvial channels, Rivers, Sediments, *Sediment transport, Braiding, Stream erosion, Discharge(Water), Streamflow, Thalweg, Foreign research, Channels, Profiles, Flood plains, Mountains, Erosion, Sedimentation.
Identifiers: *Channel wandering, *USSR.

The characteristics of channel wandering during structural sediment transport were analyzed from the results of long-term field observations. The river reach under study was the lowermost 4-km reach of one of the mountain rivers of the Black Sea coast of the Caucasus. The bottom of the river valley is filled everywhere with gravelly, bouldery deposit, with two distinct morphological elements: the flood channel bare of vegetation and individual forested floodplain areas. Over 1/3 of the reach,

the flood channel does not come into contact with the original banks; over 1/2 of the reach, the channel is confined on one side in plan; and over 1/6 of the reach, it is confined on both sides. Analysis led to the following conclusions: (1) Basically, channel wandering is as regular as other types of the channel process. However, its patterns can be identified in nature only on the basis of systematic observations. (2) Under the conditions studied, channel wandering is the result of the dynamic interaction (super-position) of channel forms belonging to various structural levels of sediment transport. (3) Wandering takes place only around motionless, inherited structural formations that control flow at a given discharge. (4) Wandering is cyclic, in agreement with the rhythmicity of structural channel formations, and the flow wanders out of phase around neighboring motionless formations. (5) Several orders of channel forms, corresponding to various structural levels of sediment transport, coexist in the relief of the channel zone. (Sims-ISWS)
W77-06305

MULTIVARIATE EMPIRICAL TEST OF THE LEOPOLD AND MILLER STREAM ORDER-HYDRAULIC GEOMETRY HYPOTHESIS,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
T. K. Miller, and L. J. Onesti.
Geological Society of America Bulletin, Vol. 88, No. 1, p 85-88, January 1977. 1 fig, 3 tab, 17 ref.

Descriptors: *Hydraulics, *Geomorphology, *Wisconsin, *Streams, *Channel morphology, Gradients(Streams), Width, Depth, Velocity, Roughness(Hydraulic), Analysis.
Identifiers: *Hydraulic geometry, *Stream order, *Pecatonica River(Wis), Multivariate analysis.

The relationship between stream order and hydraulic geometry was tested, using multivariate discriminant analysis. Data on the hydraulic geometry variables were collected for 103 streams of order 3 through 6 in the Pecatonica River drainage network in southwestern. The analysis reported in the article indicated that the relationship was not as strong as suggested by Leopold and Miller. Channel width, depth, and gradient appear to account for existing strength, whereas volicity and roughness make only a negligible contribution. (Bhowmik-ISWS)
W77-06315

ESTIMATING RUNOFF VOLUMES AND FLOOD HYDROGRAPHS IN THE COLORADO RIVER BASIN, SOUTHERN UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06334

PROPOSED HYDROLOGIC ANALYSES OF STREAMFLOW FOR BRAZIL,
Geological Survey, Reston, Va. Water Resources Div.
H. C. Riggs.
Open-file report 74-328, May 1974. 18 p, 5 ref.

Descriptors: *Water resources, *Streamflow, *Foreign projects, *Project planning, *Evaluation, Hydrologic data, Gaging stations, Flow rates, Flow characteristics, Frequency analysis, Regional analysis, Methodology, South America.
Identifiers: *Brazil.

Streamflow records are evaluated for the Rio Jacui basin in the state of Rio Grande Sul, Brazil, in reference to data reliability, length of record, and density of areal coverage. Availability of water is a factor in the development of a country, and surface water is of especial importance in Brazil. This report is intended as a reference for further investigation of the flow characteristic of the basin to provide (1) information for utilization of streamflow and (2) information to improve the data collection and analytic procedures. In addition the evaluation study can serve as a pilot for other developing river basins in Brazil. (Woodard-USGS)
W77-06343

FLOODS OF JANUARY 15-17, 1974, IN NORTHWESTERN MONTANA,
Geological Survey, Helena, Mont. Water Resources Div.
M. V. Johnson, and R. J. Omang.
Open-file Report 74-38, 1974. 8 p, 3 fig, 1 tab, 1 ref.

Descriptors: *Floods, *Flood damage, *Flood frequency, *Flood data, *Montana, Streamflow, Snowmelt, Peak discharge, Flood recurrence interval, Hydrologic data, Maps, Hydrographs.
Identifiers: Northwestern Montana.

Rain and snowmelt caused several streams in northwestern Montana to flood during January 15-17, 1974. The flooding was caused by a major rainstorm that extended from Montana through Idaho and Washington. The most damage occurred in the Kootenai River drainage, centering around the town of Libby. Also unusually high flows occurred on some streams in the Clark Fork basin. Throughout the area, ice jams contributed to much of the overbank flooding. Both the towns of Troy and Libby were partly flooded, but damage was greatest in and near Libby. Flood damage was estimated to be $4.9 million. No flood fatalities were listed. Most of the smaller streams equaled or exceeded a 50-year flood. A summary of flood stages and discharges for 24 sites in the Kootenai River drainage and 8 sites in the Clark Fork drainage is tabulated. A map shows the extent of flooding in the Libby area. (Woodard-USGS)
W77-06350

EFFECTS OF STREAM CHANNEL IMPROVEMENTS ON DOWNSTREAM FLOODS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2A.
W77-06397

THE INFLUENCE OF BOGS ON THE DISTRIBUTION OF STREAMFLOW FROM SMALL BOG-UPLAND CATCHMENTS,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 4D.
W77-06440

ROLE OF GROUND-WATER IN THE FORMATION OF THE RUNOFF AND WATER CHEMISTRY OF RIVERS IN THE LOWER TUNGUSKA BASIN,
For primary bibliographic entry see Field 2F.
W77-06506

MEANDER SINUOSITY AND DIRECTION VARIANCE,
Hull Univ. (England). Dept. of Geography.
R. I. Ferguson.
Geological Society of America Bulletin, Vol. 88, No. 2, p 212-214, February 1977. 3 fig, 1 tab, 7 ref.

Descriptors: *Meanders, *Rivers, *Curves, Hydraulics, Foreign countries, Foreign research, Equations, Channels, Channel morphology, Variability.
Identifiers: *Sinuosity, *Scotland, *England.

It was shown that the variance of channel direction along 36 meandering rivers was closely, but nonlinearly, related to sinuosity. Variances were greater than for sine-generated curves of the same sinuosity but were well predicted by assuming a normal direction distribution. It was postulated that this relationship may be useful in stochastic meander modeling and for estimating paleochannel sinuosity from fragmentary meander traces. (Bhowmik-ISWS)
W77-06521

STEPPED-BED MORPHOLOGY IN ARID GRAVELLY CHANNELS,
Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Geography.
D. Bowman.
Geological Society of America Bulletin, Vol. 88, No. 2, p 291-298, February 1977. 16 fig, 1 tab, 20 ref.

Descriptors: *Geomorphology, *Channels, *Beds, *Braiding, *Fluvial sediments, Gravels, Boulders, Thalweg, Roughness, Channel morphology.
Identifiers: *Pools, *Riffles, *Bars, *Dead Sea area, Stepping, Rapids.

The stepping phenomena in the channel bed for arid gravelly channels were investigated and reported. It was indicated that the stepping phenomenon observed was not identical to the pools and riffles in stream channel beds. Channel beds in the Dead Sea area demonstrated that the main elements in a stepped bed were the regular and the rapid segments, which constituted distinct populations. The bed material of the stepped channel was heterogeneous in size, but significant uniformity prevailed within the segment types. The cyclic spacing of the segment types deviated clearly from that of pools and riffles in that the cyclic spacing occurred at closer intervals. The coarser the sediment, the more pronounced was the segmentation. Stepping might have produced variations in flow velocities from subcritical to supercritical. Megasteps formed in the canyons, but they were not cyclic. Conditions favoring stepping indicated a coarse fluviatile environment. (Bhowmik-ISWS)
W77-06522

A SAMPLE COMPARISON OF THE GEOMORPHIC CHARACTER OF TWO RIVER BASINS AS RELATED TO SUSCEPTIBILITY TO BRIDGE FAILURE,
F. F. M. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 167, Price codes: A03 in paper copy, A01 in microfiche. Department of Transportation Report FHWA-RD-74-74, October 1974. 40 p, 5 fig, 6 tab, 19 ref, 1 append. DOT 41-42-0118.

Descriptors: *Watersheds(Basins), *Excessive precipitation, *Bridge failure, *Gemorphology, Bridges, Basins, Channels, Rivers, Rainfall, Runoff, Streams, Streamflow, Hurricanes, Precipitation(Atmospheric), Hypsometric analysis, Geology, Soils, Floods, Hydrology.
Identifiers: *Hurricane Camille, *Hurricane Agnes.

From the well-known hypothesis that it is expected that a degree of geologically based similarity would exist on the surface properties of those systems showing a similarity of surface geometry, it is reasonable to assume that drainage basins with the same degree of stability (or instability) posses a certain similarity in geomorphology and channel networks, and vice versa. This study intended to show, in part, the validity of this assumption for two river basins, to point out the imporance of a geomorphic investigation of the basin in bridge, and to emphasize the need for preventive maintenance of existing bridges. The Tye River Basin was selected as an example of an unstable basin, and the North Fork Rivanna River Basin was selected as a stable basin. The extremely intensive rainfall from Hurricane Camille was a main reason for 4 failures out of 7 bridges in the Tye River Basin; however the unstable character of the basin itself appeared to be a contribution factor in these catastrophic failures. The analysis clearly revealed the unstable character of the Type River Basin as

related to weter and sediment discharges. It was shown also that the geomorphic character of the North Fork Rivanna Basin is distinguishably different from that of the Type River Basin. (Sims-ISWS)
W77-06525

2F. Groundwater

UTILIZING A DIGITAL MODEL TO DETERMINE THE HYDRAULIC PROPERTIES OF A LAYERED AQUIFER,
Geological Survey, Bay Saint Louis, Miss.
L. F. Land.
Ground Water, Vol 15, No 2, p 153-159, March-April 1977. 6 fig, 1 tab, 13 ref.

Descriptors: *Model studies, *Hydraulic properties, *Aquifer systems, Groundwater movement, Hydraulic conductivity, Storage coefficient, Transmissivity, *Computer models.
Identifiers: *Layered aquifer characteristics, Digital models.

The hydraulic characteristics of a layered groundwater system are determined by a modified digital model. Its use provides information on the hydraulic conductivity and storage coefficient of a stratum and on the transmissivity and storage coefficient of the ground-water system as a whole. These characteristics are determined by trial and error test runs until the calculated drawdowns reasonably match drawdown data from observation wells which are open to the artesian aquifer and to the confining beds above or below. An aquifer test of a layered ground-water system in Palm Beach County, Florida, shows that the transmissivity of the ground-water system as a whole is 50 percent higher than just the transmissivity of the major water-bearing zone in this system. (Woodard-USGS)
W77-06333

WATER RESOURCES OF THE NORTH COAST LIMESTONE AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06335

BRIEF SUMMARY OF THE HYDROGEOLOGY OF BANGLADESH,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W77-06342

WATER IN A LIMESTONE TERRANE IN THE BOWLING GREEN AREA, WARREN COUNTY, KENTUCKY,
Geological Survey, Louisville, Ky. Water Resources Div.
T. W. Lambert.
Kentucky Geological Survey, Lexington, Series 10, Report of Investigations 17, 1976. 43 p, 20 fig, 4 plates, 8 tab, 45 ref, append.

Descriptors: *Karst hydrology, *Limestones, *Groundwater, *Surface waters, *Water quality, *Kentucky, Sinks, Reservoirs, Regulated flow, Streamflow, Flood frequency, Land development, Flood control, Water analysis, Chemical analysis, Water pollution sources.
Identifiers: Warren County(Ky), Bowling Green.

The Bowling Green area, which includes about 170 sq mi, illustrates some of the water problems in a karst plain. The karst plain is fairly flat to gently rolling, contains numerous closed depressions, and is underlain by a thick sequence of limestone. The Dripping Springs escarpment forms the northern boundary and generally limits the development of the area beyond. Barren River and its tributary, Drakes Creek, drain a limestone terrane and are used for nearly all public and industrial water supplies within the Barren River basin. Of the total pumpage of 8 million gallons per day, nearly 6.5 million gallons are pumped from Barren River. The use of ground water for rural domestic and stock purposes is decreasing as the water districts expand into rural areas. Since the completion of Barren River Lake, the average frequency of overbank flooding of Barren River has been reduced to once every 2 years. A low flow of 100 cfs is maintained on Barren River at Bowling Green by the release of sufficient water from the reservoir. Overbank flooding of Drakes Creek remains the same, occurring on the average of once every 1.5 years. Development of the area south of Bowling Green may increase the runoff and cause more flooding. Consideration should be given to development of the higher ground north and northwest of Bowling Green where the likelihood of flooding would be much less. (Woodard-USGS)
W77-06347

HYDROLOGIC RELATIONS BETWEEN LAKES AND AQUIFERS IN A RECHARGE AREA NEAR ORLANDO, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06348

WATER IN CARBONATE ROCKS OF THE MADISON GROUP IN SOUTHEASTERN MONTANA--A PRELIMINARY EVALUATION,
Geological Survey, Billings, Mont. Water Resources Div.
W. R. Miller.
Available from Supt. of Documents, GPO, Washington, D.C. 20402, price $2.90. Water-Supply Paper 2043, 1976. 51 p, 9 fig, 2 plates, 5 tab, 129 ref.

Descriptors: *Groundwater resources, Carbonate rocks, *Montana, *Water quality, *Aquifer characteristics, Hydrogeology, Water yield, Available water, Groundwater movement, Groundwater recharge, Stratigraphy, Test wells, Chemical analysis, Data collections, Methodology.
Identifiers: *Madison Group, *Mississippian Age, Fort Union Coal region(Mont).

Yields from wells in carbonate rocks of the Madison Group in southeastern Montana, range from about 50 gpm (gallons per minute) at several places to 1,400 gpm from a flowing well on the north side of the Porcupine dome. Yields estimated or reported from drill-stem tests range from about 1 to 157 gpm. Dissolved solids in water from the study area range from less than 3,000 mg/liter to more than 100,000 mg/liter. In the southeastern and southwestern parts of the area, calcium, magnesium, and sulfate ions constitute more than 75 percent of the dissolved constituents, in milliequivalents per liter in the north, sodium, potassium, and chloride ions constitute more than 50 percent of the dissolved constituents; in the Williston basin, sodium, potassium, and chloride ions constitute more than 75 percent of the total. (Woodard-USGS)
W77-06349

CHEMICAL DYNAMICS OF A CONFINED LIMESTONE AQUIFER,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
V. LeFebre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 666, Price codes: A12 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, WRRI Report No. 084, March 1977, 253 p, 16 fig, 4 tab, 6 ref, 3 append. OWRT B-048-NMEX(1), 14-31-0001-5093.

Descriptors: *Aquifer characteristics, *Groundwater, *Groundwater movement, Saline water intrusion, Physicochemical properties, Flow characteristics, Time, Velocity, Limestone, Recharge, Dissolved oxygen, *New Mexico, Ions, Artesian aquifers.
Identifiers: *Roswell, Limestone Aquifer(NMex), Artesia, Residence time, Ionic concentrations, Chemical saturation(Water).

The evolution of groundwater in the Roswell Limestone Aquifer is measured using some ordinary and easily determined characteristics of the water. Randomness caused by analytical error and matrix inhomogeneity is suppressed by dividing the study area into subsections on the basis of hydrologic function and by using averaged values of the measured characteristics to describe each subdivision. Temperature, ionic solute concentrations, calcite saturation, and dissolved oxygen content change in a reasonably steady and monotonic manner as the water flows from the recharge to the discharge region. Simple models are developed to quantify the oxygen and temperature measurements. On the basis of these models the groundwater flow is found to be a factor of 6 faster in the northern part of the Roswell Limestone Aquifer and the residence time is a factor of 3 longer in the southern part. Solute concentrations indicate intrusion into the northeast corner of the Limestone Aquifer from an upper Alluvium Aquifer. This study demonstrates that groundwater evolves in a measurable manner as it flows through an aquifer. Both physical (temperature) and chemical (oxygen content and calcite saturation) parameters change in a predictable fashion. (Stockton-N Mex State)
W77-06399

ROLE OF GROUND-WATER IN THE FORMATION OF THE RUNOFF AND WATER CHEMISTRY OF RIVERS IN THE LOWER TUNGUSKA BASIN,
I. N. Uglanov.
Soviet Hydrology, Selected Papers, No. 3, p 116-119, 1975. 3 fig, 3 tab, 1 ref. Translated from Gidrokhimicheskiye materialy, No. 61, p 37-43, 1974.

Descriptors: *Groundwater, *Rivers, *Base flow, Water chemistry, Chemical properties, Discharge(Water), Groundwater movement, Subsurface waters, Surface waters, Streamflow, Foreign countries, Permafrost, Foreign research, Cold regions, Hydrogeology.
Identifiers: *Lower Tunguska Basin(USSR), *USSR.

The Lower Tunguska River is one of the largest tributaries of the Yenisey River. Investigations were performed in the upper half of its basin in the central part of the Central Siberian Plateau and the following conditions were found to exist: Hydrogeologically, this region is part of the Tunguska and Angara-Lena artesian basins. Unconfined and confined interstratal waters predominate here in beds of different ages of the sedimentary mantle of the Siberian platform. These deposits are frozen to a depth of 100 m or more over much of the area. The sub- and supra-permafrost waters are connected only along fissured rocks where taliks occur. In the upper part of the basin, where permafrost is discontinuous, the role of groundwaters, mainly fresh unconfined interstratal waters, increases. Groundwaters account for about 1/4 of the annual runoff volume in the upper course of the Lower Tunguska River, and their proportion decreases downstream. They are most important in runoff formation during the winter and summer low-flow periods. The groundwaters draining the valleys of the Lower Tunguska River and of its tributaries differ in chemical composition. They have a decisive effect on the composition of the river waters, which varies along the river with the change in the hydrogeological conditions of individual parts of the basin. (Sims-ISWS)
W77-06506

2G. Water In Soils

EFFECTS OF MUNICIPAL COMPOST AND NITROGEN FERTILIZER ON SELECTED SOILS AND PLANTS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 5C.
W77-06146

EFFECTS OF SEWAGE SLUDGE AND SLUDGE COMPOST APPLIED TO SOIL ON SOME SOIL PHYSICAL AND CHEMICAL PROPERTIES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5C.
W77-06164

EFFECTS OF TRACE ELEMENTS ON UREASE ACTIVITY IN SOILS,
Iowa State Univ., Ames, Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-06165

EFFECT OF A SECONDARY TREATED EFFLUENT ON THE MOVEMENT OF VIRUSES THROUGH A CYPRESS DOME SOIL,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-06173

EFFECTS OF SEWAGE SLUDGE COMPOSITION, APPLICATION RATE, AND LIME REGIME ON PLANT AVAILABILITY OF HEAVY METALS,
Department of the Environment, Ottawa (Ontario). Office of the Science Advisor.
For primary bibliographic entry see Field 5C.
W77-06175

CADMIUM DISTRIBUTION IN FOREST ECOSYSTEMS IRRIGATED WITH TREATED MUNICIPAL WASTE WATER AND SLUDGE,
Pennsylvania State Univ., University Park. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W77-06178

MOLYBDENUM HAZARD IN LAND DISPOSAL OF SEWAGE SLUDGE,
State Univ. of New York at Binghamton. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5C.
W77-06180

EFFECTS OF ANNUAL AND ACCUMULATIVE APPLICATIONS OF SEWAGE SLUDGE ON ASSIMILATION OF ZINC AND CADMIUM BY CORN (ZEA MAYS L.),
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-06181

SOME MEASURES OF REDUCING LEACHING LOSS OF NITRATES BEYOND POTENTIAL ROOTING ZONE I. PROPER COORDINATION OF NITROGEN SPLITTING WITH WATER MANAGEMENT,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
For primary bibliographic entry see Field 3C.
W77-06232

FLOW OF WATER IN UNSATURATED UNIFORM AND LAYERED POROUS MATERIALS,
Alexandria Univ. (Egypt). Dept. of Soil and Water Science.
Y. Z. El-Shafei, and M. I. Fahmy.
Alexandria Journal of Agricultural Research, Vol. 23, Vol. 1, p 173-184, April, 1975, 7 fig, 17 ref.

Descriptors: *Capillary conductivity, *Porosity, *Porous media, *Infiltration, *Capillary water, Conductivity, Hydrology, Physical properties, Groundwater movement, Permeability, Evaporation, Soil types, Sands, Water table, Moisture, Infiltration rates.

Knowledge of the physical characteristics of soil such as water retention, capillary conductivity, and moisture profile under infiltration is needed to understand water flow in unsaturated soil. Knowing the water retention properties of the soil enables estimates of the need for and frequency of irrigation. A study was conducted with the following objectives: (1) to describe methods used for determining capillary conductivity as a function of tension, (2) to obtain research data on the capillary conductivity pressure head function and the water retention relationship for sandy soils, (3) to describe water infiltration into homogeneous sand as related to particle size and the characteristics of moisture profile, and (4) to study the effect of coarse layers on water infiltration and moisture profile in layered soils. Mathematical models are employed to determine these relationships. Experiments were conducted concerning water infiltration on homogeous and layered soil columns. The results are presented. The average infiltration of sandy clay loam soil increased when it was underlying fine sand. (Jamail-Arizona)
W77-06235

SCHEDULING IRRIGATION FOR WHEAT CROP IN LIGHT SOILS OF RAJASTHAN,
Udaipur Univ. (India).
For primary bibliographic entry see Field 3F.
W77-06243

METAL CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-06272

NITRATE AND CHLORIDE IN GROUND WATER UNDER IRRIGATED AGRICULTURE IN CENTRAL WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-06313

FIELD WATER BALANCE AND SIMULATED WATER RELATIONS OF PRAIRIE AND OAK-HICKORY VEGETATION ON DECIDUOUS FOREST SOILS,
Oak Ridge National Lab., Tenn.
R. J. Luxmoore, D. J. Van Rooyen, F. D. Hole, J. B. Mankin, and R. A. Goldstein.
Soil Science, Vol 123, No 2, p 77-84, February 1977. 6 fig, 3 tab, 12 ref. NSF AG-199, BMS69-011 47 A09, NSF/RANN AG-389.

Descriptors: *Forest soils, *Model studies, *Water balance, *Wisconsin, *Soil water movement, Evapotranspiration, On-site laboratories, On-site tests, Soil science, Soil water, Land management, Mulching, Vegetation effects, Forests, Trees, *Oak trees, Hickory trees, Grasses, Rainfall, Unsaturated flow, Evaluation, *Soil-water-plant relationships.

A steady-state model of atmosphere-soil-plant water relations, implementing the combined energy balance, aerodynamic calculation of evapotranspiration, and a five-layer Darcy soil water flow system, was used to simulate on a daily basis the water status and budget of experimental plots with either prairie grass or oak forest vegetation. A field water balance study provided independent estimates of evapotranspiration and drainage, based on measurements of soil water at several depths during the growing season. Oak forest and prairie grass vegetation in southern Wisconsin showed an average evapotranspiration rate of 2.0 cu cm/sq cm/week from mid-June to early October based on a water balance of the top 180 cm of soil. Simulation results were in close agreement with the field estimates, although differences in time distribution were shown, particularly for the prairie grass plots. Actual evapotranspiration would be greater than these results show due to soil water uptake at depths below 180 cm. Soil water drainage was negligible during most of the growing season for vegetated plots, whereas drainage from treatments without vegetation was slightly less than the precipitation received. Soil water content was generally lower on vegetated plots than on nonvegetated plots during the growing season. The model provided a means of evaluating some phenomena not measured in the field experiments. Simulations suggested that the oak vegetation was under water stress on more days during the growing season than the prairie grass. (Humphreys-ISWS)
W77-06325

EVALUATION OF ARSENIC CONCENTRATIONS IN THE TULPEHOCKEN CREEK BASIN,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06330

GENERALIZED DEPENDENCE OF MOISTURE PRESSURE AND CONDUCTIVITY ON MOISTURE CONTENT IN UNIFORM MECHANICAL SOIL FRACTIONS, (IN RUSSIAN),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
V. G. Onishchenko, and B. N. Michurin.
Pochvovedenie 4, p 82-87, 1976.

Descriptors: *Moisture content, *Pore pressure, *Conductivity, *Soil moisture, *Chernozems, Soil pressure, Soil physical properties.

The retention and migration of moisture in mechanical factions isolated from a chernozemic soil are considered. Based on reduced moisture pressure and reduced moisture conductivity concepts, the relationship of pressure to moisture and moisture conductivity coefficients to the moisture content in mechanical fractions with different specific surface were summarized.--Copyright 1976, Biological Abstracts, Inc.
W77-06369

METHODS FOR ANALYZING THE HYDROLOGICAL CHARACTERISTICS OF ORGANIC SOILS IN MARSH-RIDDEN AREAS,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
D. H. Boelter.
In: Hydrology of Marsh-Ridden Areas. Proceedings of UNESCO Symposium, Minsk, Belorussian SSR, June 1972. Studies and Records in Hydrology 19, p 161-169. The Unesco Press, Paris, 1975. 2 fig, 1 tab, 13 ref.

Descriptors: *Organic soils, Hydrologic properties, *Peat physical properties, Bulk density, Soil water, Water storage, Hydrology, *Soil analysis, Degradation(Decomposition).
Identifiers: *Fiber content, *Degree of decomposition, Histosols, Peatland.

Organic soils, prevalent to marsh-ridden areas, have unique properties requiring special precautions when hydrological characteristics are measured. The high water content and low suctions make field sampling difficult. Laboratory analysis

of water storage characteristics must be carried out with undisturbed and undried samples because changes in structure or bulk density and irreversible drying will alter these properties. The hydrological characteristics of peat materials in northern USA were found to be closely related to the degree of decomposition of the plant residues as measured by either bulk density or fibre content. Thus, the identification or classification of organic soils on the basis of the degree of decomposition of the peat material provide significant information about their hydrological characteristics and their role in the hydrology of marsh-ridden areas. (Forest Service)
W77-06439

SOIL WATER AND AIR REGIME UNDER FOREST AND AGRICULTURE IN LOESS SOILS IN SOUTHWEST GERMANY, (IN GERMAN),
Technische Universitaet, Berlin (West Germany). Institut fuer Bodenkunde.
H. P. Blume, and U. Zimmermann.
Z Pflanzenernaehr Bodenkd 6, p 541-550. 1975.

Descriptors: *Soil water, *Soil moisture, *Moisture content, *Forest soils, *Agriculture, *Loess, Forests, Cultivation, Grasslands, Soil density, Transpiration.
Identifiers: Air content, *West Germany.

Investigations on loess soils of SW Germany showed distinct differences in the water and air regimes under forest and agriculture. The water content was higher and the air content lower under cultivation and grassland as compared to forest. These results are caused by the lower transpiration from agriculture crops or cultivated plots and by higher bulk density of this soil due to tillage.--Copyright 1976, Biological Abstracts, Inc.
W77-06458

INFILTRATION OF TRITIUM-LABELED WATER IN TWO SUBSOIL LOOSENED GREYLOAM-PSEUDOGLEYS, (IN GERMAN),
Bonn Univ. (West Germany). Institut fuer Bodenkunde.
D. Schroeder, and H. W. Scharpenseel.
Z Pflanzenernaehr Bod 4/5, p 483-488, 1975.

Descriptors: *Infiltration, *Loam, Soil tests, *Tritium, Permeability, Percolation, Soil water.
Identifiers: *Pseudogleys, Greyloam.

On 2 greyloam pseudogley-soils, subsoil loosened in 1961 in tests based on the use of truncated cylinders, did not show an amelioration of water permeation. Recently conducted investigations, using tritium labeled water demonstrated that water is percolating through the loosened parts faster and in larger quantities than through the unloosened more compacted soil.
W77-06462

MOISTURE AND TEMPERATURE OF SOIL IN DIFFERENT SITES OF A FIR STAND, (IN ITALIAN),
G. Sanesi, and M. Sulli.
Ann Ist Sper Selivc 4, p 167-179, 1973.

Descriptors: *Soil moisture, *Fir trees, *Soil temperature, *Vegetation regrowth, *Reforestation.
Identifiers: Fir stands.

Data were recorded for 3 yr in various sites of a typical regenerating fir stand (i.e., a clearing invaded by bramble, an edge, and a dense stand). Soil moisture is consistently high in the clearing. The data are not sufficient to verify a correlation between natural regeneration and soil moisture under the conditions investigated. No difference appears in the soil temperature data in the various sites in the fir stand.--Copyright 1976, Biological Abstracts, Inc.
W77-06466

CHARACTERISTICS OF THE BEHAVIOR OF MOISTURE IN SANDY LOAMS AND CLAY LOAMS OF AUTOMORPHIC SOILS IN CONNECTION WITH THEIR POROSITY, (IN RUSSIAN),
Akademiya Nauk SSSr, Novosibirsk. Inst. of Soil Sciences and Agrochemistry.
V. P. Panfilov, and N. I. Chashchina.
Izv Sib Otd Akad Nauk Sssr Ser Biol Nauk 1, p 3-7, 1975.

Descriptors: *Loam, *Sands, *Clays, *Soil moisture, *Porosity, Capillary action, Pores.
Identifiers: Automorphic soils, *Pore space(Soils).

The type of pore space influences the behavior of water in soils. It causes low water supply at field capacity in sandy loams (only 42% of the total pore space is filled with water). The type of pore space causes the separate state of water and limits the movement of capillary moisture to the surface soil. The type of pore space also makes for abundant water supply and high mobility of water under natural conditions in clay loams.
W77-06483

REMOTE SENSING OF SOIL MOISTURE WITH MICROWAVE RADIOMETERS-II,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W77-06530

INVESTIGATIONS ON THE HUMIDITY AND INFILTRATION RELATIONS IN SOILS WITH DIFFERENT SUBSOIL WATER CONDITIONS WITH AND WITHOUT CROPS, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Meteorologie und Klimatologie.
R. Kaviani.
Z Acker Pflanzenbau 140(3), p 175-183, 1974.

Descriptors: Evaporation, *Infiltration, *Soil water, Lysimeters, Soil moisture, Moisture content, *Humidity, Crops, Rainfall, Seasonal, Evapotranspiration.

Bare soils, in contrast to those with crops, use up the least amount of water for evporation. This is reflected in a positive water balance in the soil without a crop. The annual amount of infiltration was also considerably greater in soil without than with a crop. This was particularly marked in the summer months, whereas in the winter months the situation was more or less balanced or even reversed. With increasing depth of the sub-soil water, the amount of infiltration diminished, the reduction being more pronounced in the summer than the winter months since the amount of water required for evaporation or evapotranspiration is primarily supplied by capillary water from the sub-soil water when the level of the sub-soil water is high and water infiltrated through the soil columns is called upon to a lesser degree. The influence of rainfall on the infiltration diminishes with the distance of the sub-soil water from the soil surface. The interrelationships between rainfall and the amount of flow through the soil was studied with all lysimeters by means of correlation analysis. This relationship is significant in the summer months only for soil without a crop, when the sub-soil water level is high, i.e., down to a depth of 1 m.
W77-06541

2H. Lakes

POLLUTANT-ASSOCIATED EMBRYONIC MORTALITY OF GREAT LAKES HERRING GULLS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemicals Div.
For primary bibliographic entry see Field 5C.
W77-06286

THE IDENTIFICATION OF PHOSPHORUS AS A GROWTH LIMITING NUTRIENT IN LOUGH NEAGH USING BIOASSAYS,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5A.
W77-06289

FEEDING MODES AND PREY SIZE SELECTION IN THE ALEWIFE (ALOSA PSEUDOHARENGUS),
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies; and Wisconsin Univ.-Milwaukee. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06293

DISTRIBUTION OF WIND-DRIVEN CURRENTS IN BODIES OF WATER AND ESTIMATION OF THE TRANSPORT OF WATER BY THEM,
A. S. Sudol'skiy.
Soviet Hydrology, Selected Papers, No. 3, p 147-154, 1975. 4 fig, 2 tab, 13 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 225, p 49-68, 1975.

Descriptors: *Currents(Water), *Winds, *Model studies, Hydraulic models, Flumes, Lakes, On-site investigations, Circulation, Water circulation, Waves(Water), Sediments, Foreign research, Pollutants, Wind velocity, Wind tides, Water transfer.
Identifiers: *Wind-driven currents, *USSR.

The action of the wind on the surface of bodies of water produced such phenomena as wind waves, wind-driven and wave currents, seiches, wind tides, etc. These phenomena have a considerable effect on the dilution and transport of pollutants, the roiling up and transport of sediments, thermal and biological processes, etc. Very little is known of currents forming under some specific wind conditions, and what is known is based mainly on laboratory investigations. The reason is the unsurmountable difficulties involved in synchronous current measurements over large bodies of water during steady winds. The development of wind-driven currents and the processes of formation of their inherent water transport systems are little known. An attempt was made here to elucidat some of the above listed problems from an analysis of the results of field and laboratory investigations. To determine and systematize the distribution of wind-driven currents in bodies of water under characteristic wind conditions, the following factors were used: a pattern of currents obtained from surveys in Lake Bol'shoye Simaginskoye, the results of laboratory investigations in aerohydraulic flumes and on models of bodies of water, the results of investigations of wind-driven currents on the model of the southern part of Lake Baykal, and published data. (Sims-ISWS)
W77-06306

ENERGY RELATIONS OF DENSITY-CURRENT FLOWS: AN EXPERIMENTAL INVESTIGATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Institut.
For primary bibliographic entry see Field 2J.
W77-06317

THE EFFECT OF HYDROTECHNICAL CONSTRUCTION ON THE PARASITES OF THE DENIPER RIVER, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
For primary bibliographic entry see Field 5C.
W77-06323

PRIMARY PRODUCTION OF THE PHYTOPLANKTON OF THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W77-06332

HISTORY OF DREDGING AND FILLING OF LAGOONS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06346

NUTRIENT BUDGETS FOR LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-06351

INLAND LAKE WATERSHED ANALYSIS,
Michigan Univ., Flint. Dept. of Physical Geography.
For primary bibliographic entry see Field 5G.
W77-06356

MAINE LAKE WATER QUALITY STRATEGY.
Maine Dept. of Environmental Protection, Augusta.
For primary bibliographic entry see Field 5C.
W77-06357

A PHOSPHORUS BUDGET FOR LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W77-06365

PRELIMINARY REPORT ON THE POLYCHLORINATED BIPHENYLS IN THE MISSISSIPPI RIVER AND LAKE PEPIN.
Minnesota Pollution Control Agency, Minneapolis. Water Quality Div.
For primary bibliographic entry see Field 5A.
W77-06370

PROPOSED TROPHIC CLASSIFICATION OF THE GREAT PONDS OF MAINE,
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
For primary bibliographic entry see Field 5C.
W77-06372

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
Rensselaer Polytechnic Inst., Troy, N. Y.
For primary bibliographic entry see Field 5C.
W77-06381

COMPARISON OF BENTHIC DIATOM COMMUNITIES IN LAKE MICHIGAN AND LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W77-06384

A PRELIMINARY ACCOUNT OF SOME LAKES AT DIFFERENT ALTITUDES IN SOUTHWEST NEW ZEALAND,
For primary bibliographic entry see Field 5C.
W77-06385

ESTIMATING DAILY RATES OF EXTRACELLULAR DISSOLVED ORGANIC CARBON RELEASE BY PHYTOPLANKTON POPULATIONS,
For primary bibliographic entry see Field 5C.
W77-06386

LAKE TRUMMEN RESTORATION PROJECT. I. WATER AND SEDIMENT CHEMISTRY,
For primary bibliographic entry see Field 5G.
W77-06387

LAKE TRUMMEN RESTORATION PROJECT. II. BACTERIA, PHYTOPLANKTON AND PHYTOPLANKTON PRODUCTIVITY,
For primary bibliographic entry see Field 5G.
W77-06388

LAKE TRUMMEN RESTORATION PROJECT. III. ZOOPLANKTON, MACROBENTHOS AND FISH,
For primary bibliographic entry see Field 5G.
W77-06389

PRIMARY PRODUCTIVITY, PHYTOPLANKTON POPULATIONS AND NUTRIENT BIOASSAYS IN CHINA LAKE, MAINE, U.S.A.,
For primary bibliographic entry see Field 5C.
W77-06390

NON-BIOLOGICAL FACTORS AFFECTING PHOSPHATE RECYCLING IN THE WATER OF A TROPICAL EUTROPHIC LAKE,
For primary bibliographic entry see Field 5C.
W77-06391

THE EFFICIENCY OF PHOTOSYNTHETIC LIGHT ENERGY UTILIZATION BY LAKE PHYTOPLANKTON,
For primary bibliographic entry see Field 5C.
W77-06393

DISTINCTIONS IN ALGAL ECOLOGY AND PRODUCTION IN TWO LINKED UPLAND LAKES, GWYNEDD, N. WALES,
For primary bibliographic entry see Field 5C.
W77-06394

EFFECTS OF ZOOPLANKTON GRAZING ON NUISANCE ALGAL BLOOMS,
South Dakota State Univ., Brookings. Dept. of Botany and Biology.
For primary bibliographic entry see Field 5C.
W77-06398

ENVIRONMENTAL STABILITY AND FISH COMMUNITY DIVERSITY,
Everglades National Park, Homestead, Fla.
For primary bibliographic entry see Field 5C.
W77-06426

INFLUENCE OF TURBIDITY ON SURVIVAL, GROWTH, AND DISTRIBUTION OF LARVAL LAKE HERRING (COREGONUS ARTEDII),
Wisconsin Univ., Superior. Dept. of Biology; and Wisconsin Univ., Superior. Center for Lake Superior Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-06434

COMPARATIVE CHARACTERISTICS OF ZOOPLANKTON OF LAKE GLUBOKOYE FOR 1972-1973 AND IN 1951, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
V. F. Matveev.
Gidrobiol Zh 11(4), p 40-46, 1975.

Descriptors: *Zooplankton, *Lakes, *Comparative productivity, *Biomass, Fluctuations, Seasonal.
Identifiers: *Lake Glubokoye(USSR), Diversity index, Mesocyclops leuckarti, Seasonal data.

A comparative study of the macrozooplankton of Lake Glubokoye (USSR) was carried out using data collected in 1951 and 1973. Mesocyclops leuckarti Claus, a summer dominant in 1951 was not found in 1973. No change was recorded in maximum levels of biomass or the information diversity index. Calculated on the basis of seasonal data in 1973 these parameters were positively correlated. Relative abundance of all the species in general did not change, some of them occurred at greater depths in 1973 than in 1951.—Copyright 1976, Biological Abstracts, Inc.
W77-06455

TOTAL MERCURY RESIDUES IN LIVERS AND EGGS OF OLDSQUAWS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
For primary bibliographic entry see Field 5C.
W77-06471

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W77-06489

NEARSHORE WAVE DIRECTION GAGE,
Geological Survey, Reston, Va. Conservation Div.
For primary bibliographic entry see Field 7B.
W77-06516

USE OF SIDE-LOOKING AIRBORNE RADAR TO DETERMINE LAKE DEPTH ON THE ALASKAN NORTH SLOPE,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.
P. V. Sellmann, W. F. Weeks, and W. J. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-011 249, Price codes: A02 in paper copy, A01 in microfiche. Special Report 230, May 1975. 10 p, 3 fig, 7 ref.

Descriptors: *Remote sensing, *Radar, *Lakes, *Depth, *Alaska, Cold regions, Ice, Ice-water interfaces, Lake ice, Aircraft, Satellite(Artificial), Instrumentation, Coasts, Thawing.
Identifiers: *Side-looking radar, *North Slope(Alaska), Frozen lakes, Radar backscatter, ERTS, Lake depth.

Side-looking airborne radar (SLAR) imagery obtained in April-May 1974 from the North Slope of Alaska beteween Barrow and Harrison Bay indicated that tundra lakes can be separated into two classes based on the strength of the radar returns. Correlations among the areal patterns of the returns, limited ground observations on lake depths, and information obtained from ERTS imagery strongly suggest that freshwater lakes giving weak returns are frozen completely to the bottom, while lakes giving strong returns are not. Brackish lakes give weak returns even when they are not completely frozen. This is presumably the result of the brine present in the lower portion of the ice cover which limits the penetration of the X-band radiation into the ice. Although the physical cause of the differences in radar backscatter has not been identifield, several possibilities were discussed. The ability to rapidly and easily separate the tundra lakes into these two classes via SLAR should be useful in a wide variety of different problems. (Sims-ISWS)
W77-06526

AN OPERATIONAL ALL-WEATHER GREAT LAKES ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 2C.
W77-06527

GREAT LAKES ALL-WEATHER ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 2C.

W77-06528

INLAND LAKE DEMONSTRATION PROJECT,
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-06599

2I. Water In Plants

WATER REGIME OF CENTRAL ASIAN DESERT PLANTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
For primary bibliographic entry see Field 2D.
W77-06150

THE PASTORAL ZONE--REPRIEVED,
For primary bibliographic entry see Field 2B.
W77-06231

PHYSIOLOGICAL PRINCIPLES OF A PLANT ADAPTATION TO DROUGHT, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
P. A. Genkel'.
Fiziol Biokhim Kul't Rast 8(2), p 132-137, 1976.

Descriptors: *Droughts, *Respiration, *Plant physiology, Dehydration, Xerophytes, *Adaptation.
Identifiers: Cryptobiosis, *Homeohydric plants, Plasma, *Poikilohydric plants.

The difference is marked between the poikilohydric (non-regulated water regime) and homoeohydric (regulated it) plants. The poikiloxerophytrs can endure considerable dehydration and turning into a state of cryptobiosis (anabiosis). This ability is connected with maintaining the energic full value of respiration during dehydration as well as with the process of cyto- or plasma contraction. At hydration, protoplasm in poikiloxerophytes gelatinizes and the inner content of cells preserves its structure and organization. In dehydration of homoeohydric plants a series of specific and nonspecific protective-adaptational reactions is observed.--Copyright 1976, Biological Abstracts, Inc.
W77-06268

THE OPTIMAL ZOOPLANKTON BIOMASS IN FISH-REARING PONDS, (IN RUSSIAN),
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Moscow (USSR).
M. A. Esipova, L. M. Solov'eva, and I. V. Glazacheva.
Gidrobiol Zh 12(2), p 66-68, 1976.

Descriptors: *Zooplankton, *Biomass, *Carp, Fish, Growth rates, *Fish hatcheries, Oxygen demand, Organic matter, *Fish food organisms, Fish diets.
Identifiers: Asphyxiation.

An increase of the biomass of zooplankton in carp ponds to 40-50 g/m3 (occasionally 100 g/m3) was associated with the accumulation of biogenic elements and organic substances in the water. At a zooplankton concentration of over 50 g/m3, the O2 demand of these organisms attained levels (4-7 mg/m3) corresponding to the normal O2 saturation level of the water. This facilitated the development of toxic and asphyxiating conditions. Zooplankton biomass of 10-20 g/m3 was optimal for the growth of carp at a stocking density of 20 centers/ha, and resulted in a mean daily growth accretion of 4-9 g/individual yearling.--Copyright 1976, Biological Abstracts, Inc.
W77-06406

DISTRIBUTION OF ASSIMILATES IN SOYBEANS DURING FRUIT GROWTH IN FLOODED SOIL, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institute of Biology and Soil Science.
For primary bibliographic entry see Field 3F.
W77-06421

ELEMENTS IN LEAVES OF A TREMBLING ASPEN CLONE BY CROWN POSITION AND SEASON,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
E. S. Verry, and D. R. Timmons.
Canadian Journal of Forest Research, Vol. 6, No. 3, p. 436-440, September 1976. 1 fig, 2 tab, 16 ref.

Descriptors: *Cycling nutrients, *Leaves, Deciduous trees, Forests, Forest watersheds, Canopy, Trace elements, Calcium, Nitrogen, Zinc, Potassium, Iron, Magnesium, Copper, Sodium, Boron, Phosphorus, Aluminum.
Identifiers: *Aspen, *Foliar elements, Crown position.

Concentrations of N, Ca, K, P, Mg, Zn, Mn, Fe, A1, B, and Cu were determined in the leaves of a 43-year old stand of populus tremulodes Michx. by upper, middle, and lower crown positions and for seven sampling dates over the growing season. Concentrations of Ca and K in the upper third crown position were consistently lower than those in either the middle or lower third positions by an average of 0.19 and 0.20% ovendry weight, respectively. Concentrations of Mg and Na remained constant over time; concentrations of N, K, and P continually decreased over time; and minor elements showed a net increase over the growing season with an intermediate peak on June 30. Suggestions for sampling schemes are given (Forest Service).
W77-06441

2J. Erosion and Sedimentation

RUNOFF AND EROSION,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
For primary bibliographic entry see Field 4D.
W77-06236

PROPERTIES OF CHANNEL WANDERING,
For primary bibliographic entry see Field 2E.
W77-06305

HILLSLOPE FORM AND CLIMATE,
Denver Univ., Colo. Dept. of Geography.
T. J. Toy.
Geological Society of America Bulletin, Vol. 88, No. 1, p 16-22, January 1977. 4 fig, 6 tab, 21 ref.

Descriptors: *Climates, *Geomorphology, *Slopes, Correlation analysis, Regression analysis, On-site investigations, Analytical techniques, Climate data, Arid climates, Humid climates, Geology, Climatology.
Identifiers: *Hillslopes, Climatic effects.

The relationship between climate and hillslope form was investigated at 29 sites along tow traverses: one from Berea, Kentucky, to Pioche, Nevada; the other from Glendive, Montana, to Ruidoso, New Mexico. A rigorous site-selection procedure was used to minimize the importance of nonclimatic factors and to ensure the inclusion of hillslopes in a variety of climatic regions. Five hillslope variables were selected for comparison with nine climate variables. Each hillslope and climate variable has a theoretical or conceptual basis for use in this study. The results supported the hypothesis that hillslopes reflect regional climatic variations. Fifty-nine percent of the variation in the rate of curvature of the convex segment was explained by the climate variables; 43% of the variation in the slope of the straight segment was accounted for on the basis of climate; 37% of the variation in the slope of a regression line fitted through the entire profile was explained by variations in climate; and 26% of the variation in the slope length ratio was explained by the climate variables. It was concluded that hillslopes in arid areas tend to be shorter, steeper, and to have smaller radii of curvature of the convex segment than those in humid areas. (Sims-ISWS)
W77-06314

CONSTRUCTIONAL SHELF TOPOGRAPHY, DIAMOND SHOALS, NORTH CAROLINA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W77-06316

ENERGY RELATIONS OF DENSITY-CURRENT FLOWS: AN EXPERIMENTAL INVESTIGATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Institut.
D. G. Kersey, and K. J. Hsu.
Sedimentology, Vol. 23, No. 6, p 761-789, December 1976. 17 fig, 5 tab, 20 ref.

Descriptors: *Density currents, *Hydraulic models, *Flumes, Freshwater-saline water interfaces, Currents(Water), Laboratory tests, Flow, Streamflow, Density, Erosion, Sediments, Friction, Fluid friction, Flow friction, Energy, Hydraulics.
Identifiers: *Saline heads, Switzerland, Lake Zurich, Lake of Walenstadt.

Three series of density-current experiments were performed in a 5.76 m flume. In the first series, the flume was horizontal; and in the second and third series, it was inclined, with a positive slope and a negative slope, respectively. Energy relations during successive stages of density-current movement were computed from observed data, which showed an appreciable frictional energy dissipation. The computed friction factors of the experimental density-flows were compared to the friction factors for pipe flows (Moody diagram), and while the calculated friction factor increases with increasing Reynold's number within the range of the experiments (2,000-20,000), it was concluded that with increasing Reynold's number above about 50,000, the friction factor decreases. For natural turbidity currents, the Moody diagram gives a reasonable estimate of the friction factor between the current and sediment bed. The value of the friction factor for the interface between the current and overlying water was found to be about 0.2 times the friction factor for the current and flume. However, due to errors inherent in measuring the depth of the current, a value of 0.4 would be more reasonable for density-currents within this experiment's range of Reynold's number. Friction tends to decrease the value of the dimensionless coefficient in Keulegan's law of saline front and to decrease the thickness of the flow. In contrast, the presence of a slope in the direction of flow tends to compensate the effect of friction. (Sims-ISWS)
W77-06317

AN AUTOMATED RAPID SEDIMENT ANALYSER (ARSA),
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
T. A. Nelsen.
Sedimentology, Vol. 23, No. 6, p 867-872, December 1976. 3 fig, 10 ref.

Descriptors: *Sediments, *Particle size, *Instrumentation, Equipment, Settling velocity, Sedimentation, Analytical techniques, Sands, Measurement, Automation, Sedimentology.

Identifiers: *Sediment analysers.

The automated rapid sediment analyser (ARSA) is a pressure-transducer grain-size analysis system. This basic Woods Hole-type fall tube was automated by the addition of a digital voltmeter, a Hewlett-Packard 9810A calculator, and an x-y plotter. Eight min after sample introduction, the system automatically produces size distribution data in 0.25-phi intervals, distribution statistics, and a plotted frequency histogram. (Sims-ISWS)
W77-06318

COMPARISON BETWEEN SIEVING AND SETTLING-TUBE DETERMINATIONS OF SAND SIZES BY USING DISCRIMINANT ANALYSIS,
Boston Univ., Mass. Dept. of Geography.
J. R. Jones, and B. Cameron.
Geology, Vol. 4, No. 12, p 741-744, December 1976. 1 fig, 2 tab, 20 ref.

Descriptors: *Sediment distribution, *Sieve analysis, *Sediments, *Size, *Statistics, Islands, Sands, Particle size, Barrier islands, Analysis.
Identifiers: *Settling tubes.

The paper presented the results of a comparative study of grain size determination by two methods, namely, sieving technique and settling-tube technique. Twenty-five sand-sized sediment samples were collected in the barrier-island sub-environments and were analyzed by both methods. On the basis of graphic sediment statistics as variables, discriminant analysis indicated that the more conventional sieving method correctly characterized 96% of the samples by subenvironments, while the settling-tube technique correctly characterized only 72% of the samples. (Bhowmik-ISWS)
W77-06319

PCB INVESTIGATIONS OF THE MISSISSIPPI RIVER AND ITS TRIBUTARIES WATER, BOTTOM SEDIMENT AND POINT SOURCES,
Minnesota Pollution Control Agency, Minneapolis. Surface and Groundwaters Section.
For primary bibliographic entry see Field 5C.
W77-06368

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W77-06489

BENTHIC INFAUNA AND MAINTENANCE DREDGING: A CASE STUDY,
Oregon State Univ., Corvallis. School of Oceanography.
J. E. McCauley, R. A. Parr, and D. R. Hancock.
Water Research, Vol. 11, No. 2, p 233-242, 1977. 4 fig, 1 tab, 29 ref. Army DACW57-73-C-0089, NSF GI-34346.

Descriptors: *Pollutant identification, *Dredging, *Benthic fauna, *Sediments, *Water quality, *Oregon, Benthos, Channel improvement, Dissolved oxygen, Chemicals, Sedimentation, Silts, Silting, Sediment transport, Biological communities, Biology, Aquatic life, Biota.
Identifiers: *Coos Bay(Ore), Dredging effects.

Monitoring studies of a small maintenance dredging operation in Coos Bay, Oregon, showed that significant decreases of benthic infaunal abundance immediately afer dredging extended at least 100 m from the site of actual dredging. The infauna re-adjusted to pre-dredging conditions within 28 days in the dredged area and within 14 days in the adjacent areas. At the spoil site a similar decrease was followed by a 2-week recovery period. It was suggested that an area subjected to maintenance dredging is also subjected to frequent disturbances from ship movements and other harbor activities, and that the infauna is well adapted to this. Thus, maintenance dredging is a relatively normal event and should not be expected to have catastrophic effects. (Sims-ISWS)
W77-06499

EFFECT OF TEMPERATURE ON CHANNEL RESISTANCE,
Riyad Univ., (Saudi Arabia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-06517

STEPPED-BED MORPHOLOGY IN ARID GRAVELLY CHANNELS,
Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-06522

THE EFFECTS OF DREDGING ON WATER QUALITY IN THE NORTHWEST,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5G.
W77-06535

PEOPLE AND THE SOUND. EROSION AND SEDIMENTATION,
Army Engineer District, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06596

2K. Chemical Processes

WATER RESOURCES OF THE NORTH COAST LIMESTONE AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06335

METHODS FOR THE DETERMINATION OF INORGANIC CONSTITUENTS IN WATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
D. E. Erdmann.
IEEE Transactions on Nuclear Science, Vol NS-22, No 2, p 870-873, April 1975. 14 ref.

Descriptors: *Water analysis, *Chemical analysis, *Analytical techniques, *Instrumentation, Spectrometers, Spectroscopy, Evaluation, *Spectrophotometry.
Identifiers: *Inorganic constituents, Atomic absorption spectrophotometry.

Methods used for determining inorganic constituents in natural waters are evaluated. A majority of metal constituents are now determined by atomic absorption spectrophotometry (AAS). Various chelation and extraction procedures when used with AAS have lowered the detection limits to the microgram-per-liter range for many metal consitutents. Aeration techniques have been developed which utilize AAS to determine such constituents as mercury, arsenic, and selenium. Vaporization techniques using graphite furnaces and similar devices linked with atomic absorption spectrophotometers provide for still lower detection limits and greater simplicity. Colorimetric procedures have proven most useful but several potentiometric methods have recently been developed which also adapt themselves well to an automated approach. Other analytical techniques described include anodic stripping voltammetry, X-ray fluorescence spectroscopy, emission spectroscopy, neutron activation analysis, and mass spectroscopy are described. (Woodard-USGS)
W77-06338

WATER IN CARBONATE ROCKS OF THE MADISON GROUP IN SOUTHEASTERN MONTANA--A PRELIMINARY EVALUATION,
Geological Survey, Billings, Mont. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06349

CHEMICAL DYNAMICS OF A CONFINED LIMESTONE AQUIFER,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
For primary bibliographic entry see Field 2F.
W77-06399

ELEMENTS IN LEAVES OF A TREMBLING ASPEN CLONE BY CROWN POSITION AND SEASON,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2I.
W77-06441

ROLE OF GROUND-WATER IN THE FORMATION OF THE RUNOFF AND WATER CHEMISTRY OF RIVERS IN THE LOWER TUNGUSKA BASIN,
For primary bibliographic entry see Field 2F.
W77-06506

EFFECT OF CRYOGENIC PROCESSES ON THE FORMATION OF SODIUM BICARBONATE WATERS,
Irkutskii Gosudarstvennyi Universitet (USSR).
A. V. Ivanov, and N. A. Vlasov.
Soviet Hydrology, Selected Papers, No. 3, p 119-122, 1975. 1 fig, Vol. 61, p 55-61, 1974.

Descriptors: *Water chemistry, *Aqueous solutions, *Laboratory tests, *Bicarbonates, Water properties, Water quality, Foreign countries, Cryogenics, Cold regions, Freezing, Carbonates, Carbon dioxide, Magnesium carbonate, Calcium carbonate, Sodium.
Identifiers: *USSR.

Waters with a low mineral content in which magnesium predominates over calcium are widespread over extensive regions of East Siberia, Yakutia, the Soviet Northeast, and Transbaykalia. The low temperature of these waters and the presence of permafrost suggest that the violation of the usual ratio between calcium and magnesium in these waters is associated with their freezing and melting. Laboratory experiments were performed which used aqueous carbon dioxide solutions of different degrees of saturation (initial and control solutions), obtained by passing CO2 through distilled water. The solutions were completely frozen at -10 C in closed polyethylene vessels and melted at 1 C. From these experiments, the following conclusions were reached: (1) The freezing of aqueous carbon dioxide solutions leads to the removal of CO2 from solution. The longer the solution is kept frozen, the more CO2 is removed; (2) The behavior of CO2 during freezing controls the behavior of calcium, affects the Ca/Mg ratio, and, as a result of CaCO3 precipitation, reduces the mineral content of the water; (3) The chemistry of the waters in soils and rocks in permafrost regions is determined by cryogenic processes; and (4) The uniqueness of carbon dioxide weathering under deep seasonal freezing and permafrost conditions is attributable to the behavior of the chemical components of natural waters upon freezing. Carbon dioxide weathering under these conditions promotes the formation primarily of sodium bicarbonate rather than calcium bicarbonate waters. (Humphreys-ISWS)
W77-06507

HYDROCHEMICAL DESCRIPTION OF THE GLACIERS OF THE CHIRCHIK RIVER BASIN,
For primary bibliographic entry see Field 2C.

W77-06510

ON THE CHARACTERISTICS AND CIRCULATION OF THE SOUTHWESTERN ATLANTIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-06524

2L. Estuaries

ANALYSIS OF LEAD IN POLLUTED COASTAL SEAWATER,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
For primary bibliographic entry see Field 5A.
W77-06159

MACROINVERTEBRATE COLONIZATION OF SPARTINA MARSHES ARTIFICIALLY ESTABLISHED ON DREDGE SPOIL,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06253

RESPONSES OF AN ESTUARINE POPULATION OF THE BLUE MUSSEL MYTILUS EDULIS TO HEATED WATER FROM A STEAM GENERATING PLANT.
Environmental Research Lab., Narragansett, R. I.
For primary bibliographic entry see Field 5C.
W77-06254

COMPARISON OF SEA WATER WITH FRESH WATER IN REARING CHUM SALMON SMOLTS,
Washington State Dept. of Fisheries, Olympia.
For primary bibliographic entry see Field 5C.
W77-06261

UPTAKE OF COPPER BY THE POLYCHAETE CIRRIFORMIA SPIRABRANCHA IN THE PRESENCE OF DISSOLVED YELLOW ORGANIC MATTER OF NATURAL ORIGIN,
California Univ., Livermore. Biomedical and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W77-06263

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-06264

DIRECT AND INDIRECT EFFECTS OF OIL ON RINGED SEALS (PHOCA HISPIDA) OF THE BEAUFORT SEA,
Ontario Veterinary Coll., Guelph.
For primary bibliographic entry see Field 5C.
W77-06267

YEASTS FROM BRACKISH WATERS IN LORRAINE, (IN FRENCH),
Nancy-1 Univ. (France). Unite de d'Enseignement et de Recherche des Sciences Pharmaceutiques.
For primary bibliographic entry see Field 5B.
W77-06269

HEAVY METALS IN ANIMALS FROM THE NORTH EAST COAST,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06271

INFLUENCE OF OXYGEN TENSION ON METABOLIC RATE OF MACROBENTHOS SPECIES OF WESTERN BALTIC AND KATTEGAT, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5C.
W77-06274

OCCURRENCE OF TUMOR-BEARING DOVER SOLE (MICROSTOMUS PACIFICUS) OFF POINT ARGUILLO, CALIFORNIA AND OFF BAJA, CALIFORNIA, MEXICO,
South California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W77-06278

EFFECT OF MIREX ON PREDATOR-PREY INTERACTION IN AN EXPERIMENTAL ESTUARINE ECOSYSTEM,
Environmental Research Lab., Gulf Breez, Fla.
For primary bibliographic entry see Field 5C.
W77-06281

PHYSIOLOGICAL AND BEHAVIORAL RESPONSES TO HYPOXIA AND HYDROGEN SULFIDE IN THE INFAUNAL ASTEROID CTENODISCUS CRISPATUS,
Maine Univ. at Orono. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06288

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD, AND COPPER. II. RELATIONSHIP OF METALS IN THE MUSSEL TO THOSE DISCHARGED BY INDUSTRY,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06296

CONSTRUCTIONAL SHELF TOPOGRAPHY, DIAMOND SHOALS, NORTH CAROLINA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
Geological Society of America Bulletin, Vol. 88, No. 2, p 299-311, February 1977. 16 fig, 39 ref.

Descriptors: *Shoals, *Topography, *North Carolina, Geomorphology, Geology, Sand waves, *Sand, Drifting(Aquatic), Geology, Sediment transport.
Identifiers: *Shelf topography, *Diamond Shoals(NC), Ridges, Sand ridges, Sand size, Substrate morphology, Sand transport.

The sandy shelf floor north of Cape Hatteras on the Atlantic coast of North America has impressed upon it a complex topography of large-scale north-trending sand ridges, smaller north-trending sand ribbons, and fields of sand waves whose crests trend east. Described herein were the topographic patterns and distribution of surficial sediments. Also, an attempt was made to assess the extent to which these characterisitcs are responses to the prevailing hydraulic regime. The surficial sand sheet seaward of Diamond Shoals on the North Carolina shelf is molded into a series of coast-parallel ridges as much as 10 m high and 5 km apart. An older cohesive substrate is exposed in the troughs. Fields of sand waves as much as 7 m high occur on the ridges and in the troughs. Their crests are normal to the ridges. Sand size varies across the sea floor in sympathy with the ridge topography. The gently inclined landward flanks are coarser grained; the steeper seaward flanks are finer grained. There is evidence to indicate that the sand ridges, like the sand waves with which they are associated, are responses to flow. However, it is not possible to demonstrate the nature of coupling between fluid motion and substrate morphology on the basis of the existing data. The landward part of the study area is subjected to a southward water drift that during winter is punctuated by intense southward pulses associated with storms. The seaward part experiences a strong, predominantly northward flow throughout most of the year, and the zone of shear appears to migrate back and forth across the study area. Regional considerations suggest a southward sand transport. However, during the period of observation, water flow and bedform asymmetry indicated northward transport. It seems probable that the transport direction reverses with time. (Lee-ISWS)
W77-06316

ON THE OCEAN TEMPERATURE DISTRIBUTION IN THE GULF OF ALASKA, 1974-1975,
Alaska Univ., College. Inst. of Marine Science.
T. C. Royer, and R. D. Muench.
Journal of Physical Oceanography, Vol. 7, No. 1, p 92-99, January 1977. 5 fig, 1 tab, 14 ref. NOAA 03-5-022-56, NESS 5-35190, NSF IDE74-13969 A02.

Descriptors: *Remote sensing, *Water temperature, *Gulfs, *Alaska, Satellites(Artificial), Infrared radiation, Circulation, Water circulation, Density, Salinity, Temperature, Continental shelf, Currents(Water), Ocean currents, Estuaries, Oceanography.
Identifiers: *Gulf of Alaska.

Infrared data gathered by the NOAA 3 and 4 satellites have made it possible to construct a detailed synoptic view of sea surface temperatures in the northern Gulf of Alaska. These satellite data were compared with simultaneous oceanographic data to yield information on vertical subsurface features. Generally, tow surface temperature regimes characterize the northern gulf throughout the year. Relatively warm surface water occurs over the continental shelf, while colder water is found farther offshore, beyond the shelf break. A narrow (5-10 km) Coastal band, with relatively low temperatures which apparently are due to terrestrial runoff, was not always present. Wave or eddy-like features were observed along the boundary between the warm and cold surface water regimes. Lateral advection and vertical mixing both contribute to maintenance of these two major surface temperature regimes. Offshelf lateral advection and/or upwelling brought colder water into the northern gulf between July 1974 and February 1975 and led to an offshelf temperature decrease of nearly 2C at 200 m depth. Such temperature decreases at depth were not evident in the shelf waters. The upper layer (less than 100 m) vertical stability was greater in the offshelf region and confined the sea-air heat loss there to a relatively shallow layer. Since the water density is controlled primarily by salinity at the temperatures and salinities found in the Gulf of Alaska, sea surface temperature changes reflect both heat loss and vertical density (salinity) structure. (Sims-ISWS)
W77-06320

COTIDAL CHARTS FOR THE PACIFIC OCEAN NEAR HAWAII USING F-PLANE SOLUTIONS,
National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
J. C. Larsen.
Journal of Physical Oceanography, Vol. 7, No. 1, p 100-109, January 1977. 10 fig, 5 tab, 7 ref.

Descriptors: *Tides, *Pacific Ocean, *Hawaii, *Model studies, Mathematical models, Ocean currents, Tidal energy, Oceans, Oceanography.
Identifiers: *Cotidal charts, *F-Plane solutins, Tidal amplitude, Tidal phase, Tidal constituents, Tidal models.

The tidal constituents K1, 01, M2, S2, N2, K2 derived from sea level records at six sites spanning the Hawaiian Islands show a systematic variation

in amplitude and phase from site to site that indicates that the tide is mainly diffracted about the Hawaiian Islands Ridge rather than diffracted about the individual islands. This variation allows the construction of cotidal charts. The tide was modeled by a small set of plane waves for a uniform depth, horizontally unbounded ocean on a flat, uniformly rotating earth appropriate to a given latitude. The ridge was modeled by an elliptically shaped cylindrical island. Proudman's approximate solution of this problem was used to determine the set of plane waves that least-squares fit the tidal observations. These plane waves made it possible to estimate the tidal motion in the deep ocean beyond Hawaii. The rms (root-mean-square) fit of the model to the Hawaiian tidal constituents was less than 7% of theconstituent amplitude. In fact, the tidal model, extrapolated out some 1200 km to Johnston Island, only differed from the tidal constituents observed there by less than 27% in amplitude and less than 18 deg in phase for the K1, O1, M2, S2, N2 and K2 constituents. The cotidal charts dervied are reasonably valid for the ocean within a 1000 km radius of Honolulu. (Sims-ISWS)
W77-06321

THE PRODUCTION OF MARINE ORGANISMS UNDER NATURAL CONDITIONS AND IN CULTURES (IN GERMAN),
Kiel Univ. (West Germany).
For primary bibliographic entry see Field 5C.
W77-06375

EFFECTS OF LEACHED MIREX ON EXPERIMENTAL COMMUNITIES OF ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, Fla.
For primary bibliographic entry see Field 5C.
W77-06376

HYDROBIOLOGICAL SITUATION OF THE GULF OF FOS IN 1969, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5B.
W77-06380

INFLUENCE OF ENVIRONMENTAL FACTORS ON SELENIUM FLUX IN TWO MARINE INVERTEBRATES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W77-06405

ZOOPLANKTON POPULATIONS IN A POLLUTED, TROPICAL EMBAYMENT,
Puerto Rico Nuclear Center, Rio Piedras. Radioecology Div.
For primary bibliographic entry see Field 5C.
W77-06410

SMALL MARINE ANIMAL COLLECTOR FOR USE BY DIVERS,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 7B.
W77-06419

THE STATUS OF BROWN PELICANS AT ANACAPA ISLAND IN 1975,
Fish and Wildlife Service, Davis, Calif.
For primary bibliographic entry see Field 5C.
W77-06465

TRANSPORT PATHWAYS OF POLYCHLORINATED BIPHENYLS IN ATLANTIC WATER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W77-06469

TOTAL MERCURY RESIDUES IN LIVERS AND EGGS OF OLDSQUAWS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
For primary bibliographic entry see Field 5C.
W77-06471

THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5B.
W77-06477

LABORATORY SURVIVAL OF LARVAE OF PALAEMON ELEGANS RATHKE AND OTHER CARIDEAN SHRIMPS IN RELATION TO THEIR DISTRIBUTION AND ECOLOGY,
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
For primary bibliographic entry see Field 5C.
W77-06478

TRACE METALS IN MUSSELS FROM THE N.W. MEDITERRANEAN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5A.
W77-06479

TRACE METALS IN CHOROMYTILUS MERIDIONALIS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
For primary bibliographic entry see Field 5C.
W77-06485

LEVELS OF PCBS AND DDTS IN MUSSELS FROM THE N.W. MEDITERRANEAN,
International Lab. for Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-06487

PCBS IN N.W. MEDITERRANEAN COASTAL WATERS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-06488

DISTRIBUTION OF LEAD, ZINC, COPPER AND MANGANESE IN THE MARINE GASTROPODS, THAIS LAPILLUS AND LITTORINA LITTOREA, AROUND THE COAST OF WALES,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-06493

EFFECTS OF IRANIAN CRUDE OIL ON THE RED SEA OCTOCORAL HETEROXENIA FUSCESCENS,
Hebrew Univ., Jerusalem (Israel). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-06494

BENTHIC INFAUNA AND MAINTENANCE DREDGING: A CASE STUDY,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2J.
W77-06499

EFFECTS OF TOPOGRAPHY ON THE CIRCULATION IN AND NEAR THE SURF ZONE--LINEAR THEORY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
C. C. Mei, and P. L-[illegible]u.
Estuarine and Coastal Marine Science, Vol. 5, No. 1, p 25-37, January 1977. 5 fig, 13 ref, 1 append.

Descriptors: *Coasts, *Currents(Water), *Mathematical models, *Beaches, Rip currents, Surf, Waves(Water), Water circulation, Model studies, Theoretical analysis, Equations, Topography, Shoals, Shores, Profiles, Oceans.

Rhythmic variation in depth along the shoreline causes variations in the radiation stress components and in the mean sea level in the Surf zone. In particular, the effect of ray deflection due to yefraction affects the radiation stress componen S sub xy only, where x is in the offshore and y in the alongshore directions respectively, and tends to oppose the influences of other components. A linearized theory for the mean current was given for normal incidence and small depth perturbation. Lateral turbulence was ignored. The positions of the rip currents were shown to depend on the surf zone width and on the on-offshore variation of depth. (Humphreys-ISWS)
W77-06500

CHLORINE-CONTAINING PESTICIDES AND POLYCHLORINATED BIPHENYLS IN BRITISH COASTAL WATERS,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-06501

MANGANESE CYCLING IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W77-06502

THE ABUNDANCES, DISTRIBUTION AND FLUX OF NUTRIENTS AND CHLOROPHYLL A IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W77-06503

A NOTE ON VOLUMETRIC CONSIDERATIONS OF UPWELLING IN THE BENGUELA CURRENT,
Canada Centre for Inland Waters, Burlington (Ontario).
E. C. Carmack, and K. Aagaard.
Estuarine and Coastal Marine Science, Vol. 5, No. 1, p 135-142, January 1977. 8 fig, 7 ref.

Descriptors: *Upwelling, *Coasts, *Ocean circulation, *Africa, On-site investigations, Nutrients, Analytical techniques, Analysis, Oceans, Evaluation, Volume, Water properties, Salinity, Water temperature, Movement, Phosphates, Nitrates, Silicates, Surveys.
Identifiers: *Benguela Current(West Africa).

The Argo data collected during the October 1968 cruise were re-examined to show how the statistical techniques of volumetric analysis can be used to provide a concise summation of a large amount of hydrographic data and to demonstrate their applicability to the physical and biochemical understanding of an upwelling region. Volumetric diagrams for temperature-salinity, temperature-phosphate, nitrate-phosphate, silicate-phosphate, and AOU-phosphate were used to quantitatively describe water properties in a region of coastal upwelling in the Benguela Current off West Africa. Nearly one-half the total volume on the shelf ex-

hibits the characteristics of water derived from the offshore depth of upwelling. The spatially mean stoichiometric ratio is Delta AOU : Delta N : Delta Si : Delta P = 210 : 11 : 10 : 1.(Humphreys-ISWS)
W77-06504

APPLICATION OF THE DIACETYL-MONOXIME THIOSEMICARBAZIDE METHOD TO THE ANALYSIS OF UREA IN ESTUARINE SEDIMENTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W77-06505

NONLINEAR FLOW OF WAVE CRESTS PAST A THIN PILE,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 8B.
W77-06515

NEARSHORE WAVE DIRECTION GAGE,
Geological Survey, Reston, Va. Conservation Div.
For primary bibliographic entry see Field 7B.
W77-06516

NUMERICAL MODEL OF ESTUARINE CIRCULATION,
Princeton Univ., N.J. Geophysical Fluid Dynamics Program.
For primary bibliographic entry see Field 5B.
W77-06519

EXPERIMENTAL STUDY OF WIND EFFECTS ON REAERATION,
National Bureau of Standards, Washington, D.C. Fluid Meters Section.
G. E. Mattingly.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY3, Proceedings Paper 12810, p 311-323, March 1977. 6 fig, 4 tab, 7 ref, 2 append.

Descriptors: *Reaeration, *Wind velocity, *Laboratory tests, *Air-water interfaces, *Oxygenation, Flow rates, Environmental effects, Mixing, Turbulence, Waves(Water).
Identifiers: *France, *Marseille(France), Roughness height.

The unique Institute of Statistical Mechanics of Turbulence (ISMT) facilities at Marseille, which are designed for the study of wind/water interactions, were used to study the role that wind plays in reaeration phenomena. The results of this laboratory study indicated that wind significantly influences the reaeration process. The wind effect can produce more than order of magnitude increases in the reaeration coefficient. Based on the experiments conducted, empirical equations were developed which relate wind-produced excess reaeration to wind and water velocities. Equations were also developed for wind shear velocity and roughness height in the wind stream over the water surface. Curve fitting techniques were used to determine the reaction constants. Improved modeling efforts can be made along with realistic economic evaluations of the necessary supplementary means such as sewage treatment to maintain acceptable water quality in surface streams and rivers. (Singh-ISWS)
W77-06520

CALIFORNIA CURRENT EDDY FORMATION: SHIP, AIR, AND SATELLITE RESULTS,
Scripps Institution of Oceanography, La Jolla, Calif.
R. L. Bernstein, L. Breaker, and R. Whritner.
Science, Vol. 195, No. 4276, p 353-359, 28 January 1977. 10 ref, 9 fig.

Descriptors: *Currents(Water), *California, *Eddies, Hydrography, Satellites(Artificial), Remote sensing, Ocean currents, Offshore platforms, Oily water, Research facilities.
Identifiers: *California current, *Eddy formation, Offshore oil drilling, Oil spills, Mesoscale variations, Research vessels, Current flow.

Quantitative measurements of the circulation of the California Current were limited to hydrographic determinations of temperature and salinity, augmented by satellite data. Clouds permitting, satellite scanner systems can locate major ocean frontal boundaries if they are associated with even quite weak horizontal sea surface temperature gradients. The satellite data are most usefully interpreted in a region such as that encompassing the California Current, where the surface and main thermocline temperature distributions have some relation to each other. In such a region, it is possible to make interpretations of circulation based on satellite-derived sea surface temperature patterns. The correctness of these interpretations depends heavily on the availability of historical and present day subsurface data. Satellite infrared scanners, in addition to providing information on circulation with vastly increased spatial resolution, have the potential (with cooperative weather) for providing increased time resolution. These improvements in resolution have permitted one to observe that much of the spatial variation in the California Current takes place along well-defined fronts and to note the evolution of one particular meander. (Roberts-ISWS)
W77-06523

ON THE CHARACTERISTICS AND CIRCULATION OF THE SOUTHWESTERN ATLANTIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
J. L. Reid, W. D. Nowlin, Jr., and W. C. Patzert.
Journal of Physical Oceanography, Vol. 7, No. 1, p 62-91, January 1977. 20 fig, 1 tab, 55 ref.

Descriptors: *Oceans, *Atlantic Ocean, *Ocean circulation, Properties, *Antarctic, Physical properties, Chemical properties, Temperature, Water temperature, Stability, Density, Salinity, Circulation, Nutrients, Oxygen, Phosphates, Deep water, Currents(Water), Ocean currents, Interfaces, Oceanography.
Identifiers: Southwestern Atlantic Ocean, *Weddell Sea, Circumpolar water.

The waters found within the southwestern Atlantic Ocean extend into it as separate layers, each with markedly different characteristics. Along the western boundary, the deeper waters, derived from the North Atlantic, are warm, highly saline, oxygen-rich, and nutrient-poor. This North Atlantic Deep Water (NADW) lies within the density range of the Circumpolar Water (CPW) from the south, which is cooler, lower in salinity, very low in oxygen, and very high in nutrients. Where the NADW and CPW meet in the southwestern Atlantic, the NADW separates the CPW into two layers above and below the NADW--each less saline, richer in nutrients, and lower in oxygen than the NADW. Above the upper branch of the CPW lies the Subantarctic Intermediate Water, which is lowest in salinity of all the layers. Beneath the lower branch of the CPW lies an abyssal layer derived from the mid-depths of the Weddell Sea. It is colder, less saline, lower in nutrients, and higher in oxygen than the Circumpolar Water. These layers appear to be separated vertically by density gradients, which tend to be sharper at the interface than in the layers themselves. These maxima in stability, which result from the interleaving of water masses from different sources, extend over hundreds of kilometers: apparently vertical exchange processes are not strong enough to dissipate them. (Sims-ISWS)
W77-06524

SHORELINE MANAGEMENT AND BOATING - CAN THE INDUSTRY SURVIVE. (REPORT ON THE FOURTH MARINE RECREATION CONFERENCE).
For primary bibliographic entry see Field 6E.
W77-06544

CONSTITUTIONALITY OF STATE FISHING ZONES IN THE HIGH SEAS: THE OREGON FISHERIES CONSERVATION ZONE ACT,
Oregon Univ., Eugene. School of Law.
For primary bibliographic entry see Field 6E.
W77-06551

MINERAL RESOURCES OF THE DEEP SEABED (HEARINGS ON HR 11879 TO PROMOTE ORDERLY CONSERVATION AND DEVELOPMENT OF THE MINERAL RESOURCE OF THE DEEP SEABED).
For primary bibliographic entry see Field 6E.
W77-06556

PEOPLE AND THE SOUND. WATER MANAGEMENT.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06594

PEOPLE AND THE SOUND. OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-06595

PEOPLE AND THE SOUND. EROSION AND SEDIMENTATION,
Army Engineer District, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06596

PEOPLE AND THE SOUND. MINERAL RESOURCES AND MINING,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-06597

PEOPLE AND THE SOUND. FLOOD DAMAGE REDUCTION.
Army Engineer District, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06598

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

MEMBRANE SCALING PREVENTION IN AN ELECTRODIALYSIS DESALINATION OF BRACKISH WATER (ZAPOBIENGANIE POWSTAWANIU KAMIENIA MEMBRANOWEGO PODCZAS ELEKTRODIALIZY WOD SLONAWYCH),
G. Blazejewska, T. Winnicki, and T. Gudra.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 11-16. 3 fig, 1 tab, 1 ref.

Descriptors: *Membranes, *Treatment facilities, *Brackish water, *Waste water treatment, *Desalination processes, Electrodialysis, Sludge, *Scaling.
Identifiers: *Ultrasonic vibration, *Membrane scaling.

Several considerations involved in the electrodialitic process were discussed. Concentration polarization, precipitation of heavily dissolving salts, and other factors were investigated to determine their influences relative to the process. Experments were described which evaluated ultrasonic vibrations as a means of preventing membrane scaling. Determinations were made on the effect of ultrasonic vibration intensity on the amounts of sludge in the concentration chamber. (Collins-FIRL)
W77-06187

MEANS FOR INCREASING THE FLOW ACROSS A REVERSE OSMOSIS MEMBRANE USING AN ALTERNATING ELECTRIC FIELD,
Desares Stiftung fuer Forderung der Forschung zur Entsalzung des Wassers (Switzerland). (Assignee).
K. M. Oesterle.
U.S. Patent No. 3,990,968, 7 p, 5 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 952, No 2, p 760, November 9, 1976.

Descriptors: *Patents, *Desalination, *Reverse osmosis, *Water treatment, *Desalination processes, Desalination apparatus, *Membrane processes, Electric currents, Electric fields, Alternating currents, Descaling, Membranes, Waste water treatment.

The flow across the membrane decreases not only due to the compaction effect on the membrane by high pressure but also as the result of accumulation of salt or salt solutions across the membrane, particularly on the feed side surface of the membrane. These concentrations produce a potential which acts in opposition to the desalination reaction. This invention proceeds on the concept of exercising a motive power on molecules, macromolecules and particles of the feed solution in the immediate neighborhood of the membrane surface. This motive power is produced by electric accelerating forces caused by an alternating electric field, and using the highest gradient possible of dielectric constants at the infinitesimal surface layer of the membrane surface. The method of the invention involves impressing an alternating electric field on the contacting surface, the field having a frequency corresponding to the relaxation frequency of the solute, the frequency being in the range from about 30 to 10,000 Hertz. (Sinha-OEIS)
W77-06454

3B. Water Yield Improvement

VEGETATION MANAGEMENT GUIDLINES FOR INCREASING WATER YIELDS IN A SEMIARID REGION: AN ARIZONA CASE STUDY,
Arizona Univ., Tucson. School of Renewable Natural Resources.
M. M. Fogel.
FAO Conservation Guide 3, Conservation in Arid and Semiarid Zones, p 73-84, 1976. 1 tab, 5 fig, 17 ref.

Descriptors: *Water yield improvement, *Vegetation effects, *Watershed management, *Semiarid climates, *Water supply, *Arizona, Vegetation establishment, Water yield, Groundwater, Surface waters, Aquifers, Water demand, Precipitation(Atmospheric), Streamflow, Water quality, Hydrologic aspects, Infiltration, Interception, Evapotranspiration, Snow management, Cost-benefit analysis.

In the state of Arizona, more water is withdrawn from its surfaces and groundwater reservoirs than is naturally being replaced and studies have been undertaken to find practices that will tend to balance water supply and demand. A review of the pertinent aspects of this research is presented as guidelines for either the operational or research phase of vegetation management to increase water supplies for water-short regions throughout the world. The role of vegetation in the process by which precipitation is converted to streamflow, selection of treatments for increasing water yield, specific water yield improvement opportunities in Arizona, and the economic considerations of vegetation management are presented and evaluated. The role of vegetation management on the hydrologic processes, water yield, and water quality is discussed. Removal or conversion of vegetation and snowpack management are discussed as treatments for increasing water yield. Benefits and costs of the programs discussed are difficult to estimate. To be valuable, the relative benefits and costs of a program adopted to increase streamflow should be carried out not only at the watershed level but down through the entire system to the ultimate user. (Jamail-Arizona)
W77-06238

RUNOFF POTENTIAL OF DESERT CATCHMENTS IN BIKANER DISTRICT,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4B.
W77-06246

COPING WITH WATER DEFICIENCY IN ARID AND SEMIARID COUNTRIES THROUGH HIGH-EFFICIENCY WATER MANAGEMENT,
Water Planning for Israel Ltd., Tel Aviv.
A. Wiener.
Ambio, Vol. 6, No. 1, p 77-82, 1977. 2 fig, 11 ref.

Descriptors: *Water resources development, *Water allocation(Policy), *Regional development, *Water supply, *Comprehensive planning, *Irrigation practices, Groundwater resources, Multiple-purpose projects, Crop production, *Water conservation, Water policy, Water reuse, *Arid lands.

In water resources planning in an arid country, a comprehensive program must take into account at least four basic considerations: spatial distribution and seasonal and cyclical variability of water resources, water requirements, pollution, and institutional constraints. In an ideal situation (no economic limitations and all decisions rational), the most comprehensive plan should be adopted utilizing all four planning strategies equally. However in reality, especially in the less developed countries, a mixed strategy must be developed accenting different priorities, allowing speedier operational decision-making with the advantage of the overall-direction offered by a comprehensive analysis. Israel is offered as an example where mixed-approach systematic planning has been used to minimize economic dislocations caused by water scarcity and to foster rapid expansion of irrigated agriculture. A historical treatment traces major water resource planning projects undertaken. Planning strategies for creating a fully integrated water supply system are outlined. (Bennett-Arizona)
W77-06248

3C. Use Of Water Of Impaired Quality

SOME MEASURES OF REDUCING LEACHING LOSS OF NITRATES BEYOND POTENTIAL ROOTING ZONE I. PROPER COORDINATION OF NITROGEN SPLITTING WITH WATER MANAGEMENT,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
B. Singh, and G. S. Sekhon.
Plant and Soil, Vol. 44, p 193-200, 1976. 1 fig, 4 tab, 9 ref.

Descriptors: *Leaching, *Irrigation effects, *Irrigation programs, *Nitrates, *Root zone, Crop production, Water management(Applied), Fertilizers.
Identifiers: *Nitrogen-splitting, *India, Unsaturated zone.

A field experiment was conducted in Punjab, India, to investigate nitrate leaching patterns from the root zone to the unsaturated zone under 12 irrigation schedules and N-splitting treatments after the harvest of wheat. The total amounts of N and water applied were the same with each treatment. As the rate of irrigation increased and its frequency decreased, more NO3--N remained unutilized and was eventually lost beyond the potential rooting zone. As irrigation becomes lighter and more frequent, nitrates travel slowly and thus remain longer within reach of the roots and are leached less beyond the rooting zone; only nitrates from the third and fourth nitrogen split remain unutilized. Nitrate absorption by the roots seems to be the main mechanism through which nitrogen loss to deeper soil layers can be prevented. The depth and efficiency of the rooting system also has an important part in determining nitrate leaching patterns near the unsaturated zone. A proper irrigation schedule and N-splitting program provides an efficient rooting system and insures higher crop yields. (Jahns-Arizona)
W77-06232

FERTILITY AND MIXED SALINITY ON GROWTH AND CA, MG, NA, P AND CI CONCENTRATIONS OF TOMATO, CORN, AND SUDAN GRASS GROWN IN SAND CULTURE,
California Univ., Los Angeles. Plant Nutrition.
P. Patel, and A. Wallace.
Communications in Soil Science and Plant Analysis, Vol. 7, No. 4, p 375-385, 1976. 8 tab, 12 ref.

Descriptors: *Salinity, *Salt balance, *Crop response, *Crop production, *Fertility, Fertilizers, Fertilization, Soil chemical properties, Sudan grass, Tomatoes, Corn(Field), Sodium compounds, Phosphorus compounds, Water management(Applied), Salts.

A study was conducted to evaluate phosphorus-salinity interactions in three crops under controlled conditions, using Ca-Na chloride salinity. Experiments were conducted in a greenhouse on tomato, corn, and Sudan grass. Corn and tomato yields decreased as salinity increased, while in Sudan grass yield increased slightly at the low salinity level but decreased at the higher level. Yields of tomato, corn, and Sudan grass were significantly increased by phosphorus fertilization at the medium salt treatment level, but the phosphorus fertility effect was negligible at the high salt level. Salinity treatments significantly increased calcium concentrations in all crops because calcium was a component of the salinity. Responses to phosphorus fertilization may be obtained even with moderate amounts of salinity semi-tolerant crops. At high salinity levels, however, there may be no response from phosphorus fertilization even if the amount of available phosphorus were low, because salinity would be the limiting factor. (Jamail-Arizona)
W77-06233

EFFECT OF GENOTYPE AND RAINFALL ON YIELD AND QUALITY OF FORAGE BARLEY AND WHEAT VARIETIES IN A SEMI-ARID REGION,
Agricultural Research Inst., Nicosia (Cyprus).
For primary bibliographic entry see Field 3F.
W77-06234

MODEST TECHNIQUES.
For primary bibliographic entry see Field 6G.
W77-06237

YIELD AND NITROGEN UTILIZATION BY WHEAT IN RELATION TO MOISTURE AND FERTILITY LEVELS,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.

W77-06241

SALINITY AND WATERLOGGING IN THE NEAR-EAST REGION,
Food and Agriculture Organization of the United Nations, Cairo (Egypt). Near East Regional Office.
M. M. Elgabaly.
Ambio, Vol. 6, No. 1, p 36-39, 1977, 1 tab, 7 ref.

Descriptors: *Salinity, *Irrigation effects, *Irrigation efficiency, *Saline water, *Soil water, Arid lands, Irrigation, Irrigation water, Semiarid climates, Water resources, Surface irrigation, Subsurface irrigation, Brackish water, Alkalinity, Water management(Applied), Leaching, Irrigation systems, Seepage, Water storage, Water requirements, Groundwater, *Saturated soils.
Identifiers: Drip irrigation, *Near-East region.

Soil deterioration caused by waterlogging and salinity of irrigated land in arid and semiarid areas is a serious problem, especially as more land is irrigated in developing countries in efforts to meet increasing food demand. The problems of waterlogging and salinity and possible solutions are discussed in relation to the Near East region which is characterized by low annual rainfall of irregular nature and uneven distribution. Available water resources for irrigation consist of both surface water and groundwater. Much of the groundwater is saline, and the problems of its use for irrigation are discussed. Irrigation practices and inadequate drainage resulting in inefficient water use, causes of salinity, alkalinity and waterlogging, and salinity control are also discussed. Improved water management practices are evaluated, including control of water table depth, land levelling, leaching requirements, reduction of water loss, maintaining a favorable salt balance, and the selection of proper irrigation methods. It is essential to develop a system of monitoring changes taking place in the soil so that counter-measures can be taken before serious soil degradation occurs. (Jamail-Arizona)
W77-06244

OKLA. SEARCHES FOR DROUGHT-RESISTANT SEED,
For primary bibliographic entry see Field 3F.
W77-06245

EFFECT OF THE QUALITY OF IRRIGATION WATER ON THE YIELD OF SOME WHEAT (TRITICUM AESTIVUM) VARIETIES IN A SANDY SOIL OF RAJASTHAN,
Udaipur Univ. (India).
G. L. Maliwal, S. S. Manchar, and K. V. Paliwal.
Annals of Arid Zone, Vol. 15, No. 1 and 2, p 17-22, March and June, 1976. 2 tab, 8 ref.

Descriptors: *Impaired water use, *Saline water, *Salt tolerance, *Irrigation effects, Soil types, Sands, Irrigation, Irrigation water, Salinity, Salts, Wheat, Impaired water quality, Clays, Leaching, Crop production.
Identifiers: *Rajasthan(Soils).

A two-year field experiment was conducted on sandy soil to study the effect of irrigation water quality on the yield of four varieties of wheat. Results indicate that grain yield was more affected by water quality than straw yield. Further conclusions are drawn concerning salinity and crop growth. The use of extremely saline waters on highly permeable light sandy soil is quite reasonable. Under such conditions there is either a much smaller accumulation of salts or the salts accumulated in the previous irrigation are leached down in subsequent irrigations leading to a much smaller salt concentration than the critical limit of salt tolerance of the crop grown. Moreover, the actual period of contact of saline irrigation water with roots of the plant is much less, due to rapid gravity flow in sandy soil as compared to clay loam or clayey soils. The yield potential of the four varieties of wheat is presented. (Jamail-Arizona)
W77-06247

QUALITY OF UNDERGROUND IRRIGATION WATER IN THE SEMI ARID TRACT OF AGRA DISTRICT,
Raja Balwant Singh Coll. (India). Dept. of Agricultural Chemistry.
P. Narain, B. Singh, and B. Pal.
Annals of Arid Zone, Vol. 15, No. 1 and 2, p 8-16, March and June, 1976. 2 fig, 3 tab, 5 ref.

Descriptors: *Irrigation water, *Water quality, *Saline water, Impaired water use, *Subsurface waters, Semiarid climates, Irrigation, Subsurface irrigation, Brackish water, Salinity, Soil chemical properties, Arid lands, Alkalinity, Wells, Cations, Sodium, Anions.
Identifiers: *Agra district(India).

A survey was conducted in the semiarid Agra district of India to determine the extent of the problem of salinity and alkalinity of subsurface waters used for irrigation. Over four hundred samples of the water were analyzed for chemical content. The results are presented. Average composition of cations and anions is depicted graphically. Sodium was the dominant cation in these waters, followed by magnesium and calcium. With increased salinity of the water samples, concentrations of sodium, magnesium and calcium also increased, the sodium increase being greatest. An increase in the concentration of chloride at higher salinity was associated with decrease in the concentration of the sulphate ion. Boron content was found to increase with the increasing salinity of underground water in areas of higher aridity. (Jamail-Arizona)
W77-06249

NITRATE AND CHLORIDE IN GROUND WATER UNDER IRRIGATED AGRICULTURE IN CENTRAL WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-06313

WATER POLLUTION FROM INDUSTRIAL SOURCES IN SWEDEN AND RECENT TRENDS TO PREVENT IT,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5G.
W77-06383

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6E.
W77-06534

THE COLORADO RIVER SALINITY PROBLEM--OLD APPROACHES TO A NEW ISSUE,
For primary bibliographic entry see Field 5G.
W77-06540

3D. Conservation In Domestic and Municipal Use

PROCESSING OF COMBINED DOMESTIC BATH AND LAUNDRY WASTE WATERS FOR REUSE AS COMMODE FLUSHING WATER,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 5D.
W77-06196

AVAILABILITY OF WATER SUPPLIES IN NORTHWEST GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06336

INTEREST GROUP PERCEPTIONS OF DEVELOPMENT ISSUES IN TIDEWATER VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W77-06400

COMBINED WATER METER AND PRESSURE REGULATOR,
Kaiser Aerospace and Electronics Corp., Oakland, Calif. (Assignee).
R. G. Coffman.
U.S. Patent No. 3,990,299, 12 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 952, No 2, p 540, November 9, 1976.

Descriptors: *Patents, *Water conservation, *Water control, *Domestic water, *Efficiences, *Water consumption, Measurement, Water measurement, Instrumentation.
Identifiers: Water pressure regulators.

A water meter and regulator that can be used to replace existing water meters without significant modifications in the piping to and from the existing water meter promotes water conservation by providing for water pressure reduction in an economical manner. The invention has a housing which contains both a water meter and a pressure regulator stacked vertically so that the overall diameter of the housing is equivalent to that of existing water meters. A removable partition separates the cavities and removal of the partition provides access to both cavities for maintenance. The pressure regulator includes a reciprocable valve and the partition has a guide for such valve so that when the partition is removed the valve is accessible. The lower cavity contains a back pass check valve for affording reverse flow should the output pressure exceed the input pressure; a pressure relief valve for releasing water to the exterior of the apparatus should pressure downstream of the apparatus reach an excessive level; and a screen for preventing entry of solid particulates into the relatively delicate meter mechanism in the upper chamber. (Sinha-OEIS)
W77-06452

SEASONAL AND WAVELENGTH DEPENDENCE OF URBAN/RURAL RADIANCE IN IOWA,
Iowa State Univ., Ames. Dept. of Aerospace Engineering; and Brooks, Borg and Skiles, Des Moines, Iowa.
For primary bibliographic entry see Field 7B.
W77-06514

THE IMPACT OF PUBLIC LAW 92-500 ON MUNICIPAL POLLUTION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-06532

PEOPLE AND THE SOUND. OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-06595

3E. Conservation In Industry

THE USE AND RE-USE OF SEWAGE EFFLUENT,
Thames Water Authority, London (England).
For primary bibliographic entry see Field 5D.
W77-06116

A REFRESHER ON SODIUM HYPOCHLORITE.
For primary bibliographic entry see Field 5D.
W77-06142

FAST PAYOUT FROM IN-PLANT RECOVERY OF SPENT SOLVENTS,
Teale (J. W.) Associates, Woodcliff Lake, N. J.
For primary bibliographic entry see Field 5D.
W77-06210

SILVER RECOVERY FROM PHOTOGRAPHIC WASH WATERS BY ION EXCHANGE,
De Luxe General, Inc., Hollywood, Calif.
For primary bibliographic entry see Field 5D.
W77-06212

WASTE TREATMENT SYSTEM CUTS WATER USE BY 2/3.
For primary bibliographic entry see Field 5D.
W77-06217

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS,
Lundberg (A. H.), Inc., Mercer Island, Wash.
For primary bibliographic entry see Field 5G.
W77-06225

POWER GENERATION FROM HOT BRINES,
I. Sheinbaum.
U.S. Patent No. 3,988,895, 8 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 952, no 1, p 56, November 2, 1976.

Descriptors: *Patents, *Geothermal studies, *Thermal studies, Heat exchangers, Heat transfer, Electric power production, Corrosion, Scaling.

A method of producing power from geothermal heat with fluid as the carrier is by recovering the heat from the liquid portion of a geothermal fluid which may contain salts and other dissolved minerals. The steps are: passing the geothermal liquid in heat exchange relationship above the ground by direct contact with a working fluid to vaporize the working fluid, the working fluid having a boiling point below the input temperature of the geothermal fluid; and expanding resulting vaporized fluid in a power extracting gas expansion device. (Sinha-OEIS)
W77-06442

PROCESS FOR RECOVERY OF DISSOLVED MERCURY SALTS FROM AQUEOUS SOLUTIONS,
Georgia-Pacific Corp., Portland, Oreg. (Assignee).
For primary bibliographic entry see Field 5D.
W77-06445

METHOD AND APPARATUS,
Ecodyne Ltd., Oakville (Ontario). (Assignee).
For primary bibliographic entry see Field 5D.
W77-06446

METHOD FOR CONSTRUCTING AN ICE PLATFORM,
Sun Oil Co., Dallas, Tex. (Assignee).
J. F. Lea, Jr, and J. E. Zupanick.
U.S. Patent No. 3,990,253, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 952, No. 2, p 525, November 9, 1976.

Descriptors: *Patents, *Ice, *Sea ice, *Cold weather construction, *Offshore platforms, Oil industry, Drilling, Exploration, Arctic, Structures, Freezing, Thermodynamics.
Identifiers: Ice islands.

A work platform for oil drilling, oil production, or other purposes is constructed in arctic waters by locating a natural ice island of suitable area and thickness, and moving it to the desired platform location. The ice island is anchored to the sea floor by installing at least one, but prefereably a number of, generally cylindrical sheats beneath it which extend from the island to the sea floor below. The sheats are filled with water, and a thermosiphon is installed interiorly of the sheath. As the thermosiphon extracts heat from the water within the sheath, the water is converted to ice, and eventually the entire body of water within the sheath is frozen, thereby forming a column of ice which anchors the island to the sea floor in the desired location. (Sinha-OEIS)
W77-06451

3F. Conservation In Agriculture

THE PASTORAL ZONE--REPRIEVED,
For primary bibliographic entry see Field 2B.
W77-06231

SOME MEASURES OF REDUCING LEACHING LOSS OF NITRATES BEYOND POTENTIAL ROOTING ZONE I. PROPER COORDINATION OF NITROGEN SPLITTING WITH WATER MANAGEMENT,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.
For primary bibliographic entry see Field 3C.
W77-06232

FERTILITY AND MIXED SALINITY ON GROWTH AND CA, MG, NA, P AND CI CONCENTRATIONS OF TOMATO, CORN, AND SUDAN GRASS GROWN IN SAND CULTURE,
California Univ., Los Angeles. Plant Nutrition.
For primary bibliographic entry see Field 3C.
W77-06233

EFFECT OF GENOTYPE AND RAINFALL ON YIELD AND QUALITY OF FORAGE BARLEY AND WHEAT VARIETIES IN A SEMI-ARID REGION,
Agricultural Research Inst., Nicosia (Cyprus).
A. Hadjichristodoulou.
Journal of Agricultural Science, Vol. 87, No. 3, p 489-497, Dec. 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Crop production, *Barley, *Wheat, *Crop response, *Semiarid climates, Rainfall, Soil-water-plant relationships, Forages.
Identifiers: *Dry-matter yield, *Cyprus, Crude protein.

Results are reported of a 5-year study of the effect of rainfall on dry-matter (D.M.) yield, D.M. content, and crude protein (CP) of 8 forage barley and 3 wheat varieties under semi-arid conditions in Cyprus. Both genotype and rainfall affect D.M. yield and its chemical composition. Genetic variability in cereals can be exploited to increase forage yields under semi-arid conditons. The 628 barley offered highest mean yields (6.7 and 0.69 t/ha of D.M. and CP respectively), had the greatest response to annual rainfal (33 g D.M./mm rainfall), and gave high yields in all environments. Late varieties had higher D.M. and lower CP contents than early varieties; all had average stability. Regrssion coefficients between D.M. yield and mean yield of varieties for all environments ranged from 0.81 to 1.14 and were unrelated to variety D.M. yield. The fraction of D.M. yield variation explained by annual rainfall differences ranged from 25 to 67%, depending on the variety. Varietal response to annual rainfall, as expressed by the regression coefficient between D.M. yield and annual rainfall, was positively related to D.M. yield. CP yield was also affected by annual rainfall, with correlation coefficients ranging from 0.49 to 0.76, according to variety; correlations tended to be negative, though not significant. (Jahns-Arizona)
W77-06234

VARIATIONS IN RAINFALL AS A NATURAL CONSTRAINT ON AGRICULTURE,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage.
For primary bibliographic entry see Field 2B.
W77-06240

YIELD AND NITROGEN UTILIZATION BY WHEAT IN RELATION TO MOISTURE AND FERTILITY LEVELS,
Central Arid Zone Research Inst., Jodhpur (India).
S. D. Singh, and R. K. Aggarwal.
Annals of Arid Zone, Vol. 15, No. 1 and 2, p 43-52, March and June, 1976. 2 fig, 3 tab, 12 ref.

Descriptors: *Soil moisture, *Nitrogen, *Crop production, *Fertilizers, Moisture content, Moisture availability, Irrigation, Irrigation effects, Irrigation water, *Wheat, Soil water, Plant growth, Nutrients, Arid lands.

Research in arid areas has shown that dwarf wheat frequently responds to nitrogen fertilization and these responses are regulated by moisture conditions. Relationships of soil water and crop growth are thus complicated by the availability of soil water and of essential plant nutrients. This study describes the influence of a variable moisture supply on the yield of wheat and use efficiency of applied nitrogen. Experiments were conducted with wheat on a sandy loam soil. Results indicate that the yield increased as the moisture supply was increased, the general trend being one of a modest decrease in percent of nitrogen in grains and nitrogen requirements, but nitrogen uptake showing a steady increase. Use efficiency of applied nitrogen increased with increase in moisture supply decreased with increasing levels of nitrogen. Irrigation at 50 percent water depletion level and 80 kilograms N/ha ma[illegible] a suitable water-nitrogen combination for op[illegible]um yield of wheat and nitrogen utilization under [illegible]mited water and fertilizer supplies. (Jamail-Arizona)
W77-06241

PROLONGED DRY SPELLS AT BELLARY DURING THE SOUTHWEST MONSOON SEASON,
University of Agricultural Sciences, Bangalore (India).
For primary bibliographic entry see Field 2B.
W77-06242

SCHEDULING IRRIGATION FOR WHEAT CROP IN LIGHT SOILS OF RAJASTHAN,
Udaipur Univ. (India).
R. S. Ram, and R. M. Singh.
Annals of Arid Zone, Vol. 15, No. 1 and 2, p 77-84, March and June, 1976. 3 tab, 4 ref.

Descriptors: *Moisture availability, *Moisture deficit, *Soil moisture, *Water requirements, *Irrigation efficiency, Evaporation, Irrigation, Irrigation water, *Wheat, Soil types, Sands, Lysimeters, Evaporation pans, Evapotranspiration, Irrigation practices, Water loss, Moisture, Soil water, Moisture stress, *Crop production, Water utilization.
Identifiers: *Rajasthan(India).

Experiments were conducted to determine the water requirements of wheat in light soils during different growth states and to schedule irrigation on the basis of pan evaporation measurements. The studies were conducted in weighing lysimeters

at Jobner, India. The soil was sandy, water availability low, and irrigation frequent. Water was applied at 30 and 40 percent available soil moisture (70 and 60 percent depletion). Daily loss in weight in both lysimeters was recorded as actual evaporation. The crop was harvested after maturity and yield recorded. The results are presented. The yield of wheat per area per unit water was better when irrigated at 40 percent available soil moisture than at 30 per cent. Total evapotranspiration in the season when irrigated at 40 percent available soil moisture was 366 millimeters, and 11 irrigations were needed including pre-sowing irrigation. (Jamail-Arizona)
W77-06243

OKLA. SEARCHES FOR DROUGHT-RESISTANT SEED,
Soybean Digest, Vol. 36, No. 3 p 23, January, 1976.

Descriptors: *Moisture stress, *Soybeans, *Oklahoma, *Seeds, Agriculture, Crops, Agronomic crops, Stress, Drought tolerance, *Drought resistance, Crop production.
Identifiers: *Drought resistance seeds.

The possibility of growing soybeans in a more arid region of Oklahoma than where they are now grown is discussed. Oklahoma State University is conducting research including testing some experimental small-seeded types which may be adaptable to drier areas. A small seed should fill better than larger seeds, which wrinkle under moisture stress. The experimental seed is about two-thirds the size of most soybean varieties. Normal seed runs about 12 to 15 grams per 100 seeds, while the smaller seeds average about 8 or 9 grams. With smaller seed, it is hoped that soybeans can be grown in the more arid regions without irrigation. It is estimated that three to five years of testing will be needed to determine how successful the small seeds will be. Soybeans are often double cropped with wheat in Oklahoma. (Jamail-Arizona)
W77-06245

COMBINED USE OF GROUND AND SURFACE WATERS FOR IRRIGATION,
D. M. Kats.
Soviet Hydrology, Selected Papers, No. 3, p 190-194, 1975. 3 tab, 13 ref. Translated from Gidrotekhnika i Melioratsiya, No. 7, p 29-34, 1975.

Descriptors: *Irrigation, *Groundwater, *Surface waters, Irrigation practices, Water requirements, Irrigation efficiency, Irrigation water, Leaching, Foreign research, Runoff, Infiltration, Groundwater movement, Canals, Wells, Water wells, Aquifers, Recharge, Agriculture.
Identifiers: *USSR.

Analysis of Soviet and foreign experience has shown that in regions with some groundwater reserves, it is advisable to use surface water in combination with groundwater for irrigation. This will permit expanding the area under irrigation, increasing the water supply to irrigation systems during the growing period and years of low flow, providing a favorable groundwater regime and associated water-salt regime of soils in irrigated lands, and regulating the water regime in dry periods in the humid zone. It is advisable to use groundwater (pumped from wells, drainage waters, waters discharging at the surface) together with surface water to increase the water supply to irrigation systmes, to expand irrigation, and to improve the land. According to computations, the groundwater reserves in most irrigated regions, especially in the foothills and in intermontane basins, could be used for irrigation without detriment to water supply. Projects calling for the combined utilization of ground and surface waters for irrigation of those calling for the use of surface waters alone must be developed with allowance for forecasts of the groundwater regime and drainage construction costs. The use of groundwater for irrigation requires measures for preventing its exhaustion and deterioration of its quality. The development of economical methods of freshening drainage waters and mineral-bearing groundwaters is a very important problem, which must be solved to develop irrigation and protect river water quality. (Sims-ISWS)
W77-06309

DISTRIBUTION OF ASSIMILATES IN SOYBEANS DURING FRUIT GROWTH IN FLOODED SOIL, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institute of Biology and Soil Science.
E. G. Zvereva, and B. I. Bartkov.
Fiziol Biokhim Kul't Rast 8(2), p 204-208, 1976.

Descriptors: *Distribution, *Soybeans, *Flooding, Photosynthesis, Leaves, Fruit, Soil moisture, Plant physiology, Translocation, Growth.
Identifiers: Assimilates, Carbon-14, USSR.

After 7 days flooding, photosynthesis products moved from leaves of the cultivar 'Primorskaya 5299' (USSR) to fruits at the axils of 14CO2-labeled leaves and also to fruits at lower nodes. Although excessive soil moisture decreased flow rate of assimilates from leaves and to the roots, and caused fruit and leaf abscission, the functioning of the photosystems did not change, indicating the high self-regulation of soybeans under unfavorable conditions.--Copyright 1976, Biological Abstracts, Inc.
W77-06421

NOVEL IRRIGATION SYSTEM AND METHOD FOR ITS APPLICATION,
F. R. do Valle.
U.S. Patent No. 3,990,181, 6 p, 4 fig, 18 ref; Official Gazette of the United States Patent Office, Vol. 952, No 2, p 499, November 9, 1976.

Descriptors: *Patents, Irrigation, *Subsurface irrigation, *Irrigation canals, *Irrigation efficienty, Channels, Soil-water-plant relationships, Fertilization, *Irrigation practices, Water distribution(Applied).
Identifiers: Row crops.

A row crop such as coffee plants is irrigated and fertilized by excavating the ground along each row of the crop to form a trench in which unglazed drainage tiles are laid in a row with cement-sand joints. The tile is covered with soil and then phosphate fertilizer, soil, a straw and fertilizer mulch and soil are applied in unsuccessive layers to just below the top of the trench. Soil is embanked along the edge of the trench. Risers are provided at each end of the tile row and a riser is filled with water to allow it to percolate toward the plants In this way all of the plant stems can be reached in a manner similar to that of houses in a city receiving their water supply from a main distribution pipe passing beneath the street centerline. In the irrigation process, the roots act as connecting means and even if they do not reach the drain tiles they enter the wet field created by water oozing from the drain tiles. (Sinha-OEIS)
W77-06450

SOIL WATER AND AIR REGIME UNDER FOREST AND AGRICULTURE IN LOESS SOILS IN SOUTHWEST GERMANY, (IN GERMAN),
Technische Universitaet, Berlin (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2G.
W77-06458

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

RUNOFF AND EROSION,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
For primary bibliographic entry see Field 4D.
W77-06236

INDIRECT ESTIMATION OF HYDROLOGIC PARAMETERS,
Idrotecneco, Rome (Italy). Data and Systems Analysis Group.
For primary bibliographic entry see Field 2E.
W77-06300

COMBINED USE OF GROUND AND SURFACE WATERS FOR IRRIGATION,
For primary bibliographic entry see Field 3F.
W77-06309

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W77-06326

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W77-06327

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, SOUTHWEST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06328

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, NORTHWEST AND ARCTIC SLOPE, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06329

ESTIMATING RUNOFF VOLUMES AND FLOOD HYDROGRAPHS IN THE COLORADO RIVER BASIN, SOUTHERN UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
J. H. Eychaner.
Water-Resources Investigations 76-102, November 1976. 18 p, 5 fig, 6 tab, 4 ref.

Descriptors: *Floods, *Hydrographs, *Utah, *Colorado River basin, *Flood protection, Water storage, Culverts, Streamflow, Flow rates, Peak discharge, Correlation analysis, Hydrologic data, Synthetic hydrology, Flood profiles, *Estimating, *Runoff.
Identifiers: Southern Utah.

Hydrographs of 364 floods from 18 continuous-record gaging sites in the Colorado River basin in southern Utah were used to define a single relation of flood volume to peak discharge; the standard error of estimate of that relation is 82 percent. Using the same data, a mean dimensionless hydro-

graph was prepared. Synthetic hydrographs may be derived for basins of 5 to 300 square miles and flood peaks of 1 to 7,000 cubic feet per second using that mean dimensionless hydrograph. A method is presented to estimate the reduction in culvert or bridge size resulting from use of storage above the structure. Reduction of structure capacity of 25 percent may be achieved by storing 4 percent of the total flood volume. (Woodard-USGS)
W77-06334

AVAILABILITY OF WATER SUPPLIES IN NORTHWEST GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
C. W. Cressler, M. A. Franklin, and W. G. Hester.
Georgia Department of Natural Resources, Atlanta, Geologic and Water Resources Division Bulletin 91, 1976. 140 p, 70 fig, 52 tab, 15 ref, append.

Descriptors: *Available water, *Surface waters, *Groundwater resources, *Water quality, *Georgia, Hydrologic data, Streamflow, Flow rates, Aquifer characteristics, Pumping, Water yield, Springs, Water utilization, Chemical analysis.
Identifiers: Northwest Georgia.

Northwest Georgia includes 10 counties that lie mainly in the Valley and Ridge Province and partly in the Cumberland Plateau. The 10-county area has abundant supplies of both ground water and surface water. All the counties have carbonate aquifers that will supply 25 to 500 gpm (gallons per minute) to wells less than 350 feet deep. Most of them have aquifers that can yield 100 to 1,000 gpm. Wells in Polk County yield as much as 1,500 gpm. The well water is moderately mineralized and can be used for many purposes without treatment. Springs in each of the 10 counties discharge hundreds of gallons of water per day. Some of the springs discharge more than 5,000 gpm, most of which is unused. The spring water generally is moderately hard to hard and has a low iron concentration. Several industries use the water untreated. Most of the area's towns and industrial centers lie along streams or rivers that have large enough flows to supply future needs. The Dalton area is a major exception; Dalton now pumps 40 million gallons of surface water per day during the average work week. This pumpage is approaching the combined low flows of the Conasauga River, Coahulla Creek, and Mill Creek, as they flow by Dalton. (Woodard-USGS)
W77-06336

PROPOSED WATER-SUPPLY INVESTIGATIONS IN SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W77-06340

WATER SUPPLY FOR THE ARRERO PILOT AREA OF THE NATIONAL RANGE DEVELOPMENT PROJECT, SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W77-06341

PROPOSED HYDROLOGIC ANALYSES OF STREAMFLOW FOR BRAZIL,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06343

HISTORY OF DREDGING AND FILLING OF LAGOONS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06346

WATER IN A LIMESTONE TERRANE IN THE BOWLING GREEN AREA, WARREN COUNTY, KENTUCKY,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06347

HYDROLOGIC RELATIONS BETWEEN LAKES AND AQUIFERS IN A RECHARGE AREA NEAR ORLANDO, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06348

FLOODS OF JANUARY 15-17, 1974, IN NORTHWESTERN MONTANA,
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06350

ENVIRONMENTAL IMPACT ANALYSIS: A CASE STUDY OF THE ENVIRONMENTAL IMPACT OF THE CONSTRUCTION OF A DAM IN ZARIA PROVINCE,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6G.
W77-06352

STATE OF IDAHO, INTERIM STATE WATER PLAN, PRELIMINARY REPORT.
Idaho Water Resource Board, Boise.
For primary bibliographic entry see Field 6B.
W77-06358

TECHNICAL AND SUPPORT INFORMATION FOR THE STATE WATER PLAN-PART II. SNAKE RIVER BASINS.
Idaho Department of Water Resources, Boise.
For primary bibliographic entry see Field 6B.
W77-06359

SUMMARY REPORT CONCLUSIONS AND RECOMMENDATIONS: PANHANDLE RIVER BASINS, STATE WATER PLAN--PART TWO.
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 6B.
W77-06360

THE CALIFORNIA STATE WATER PROJECT SUMMARY: 1974.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 8A.
W77-06362

EXPERIMENTAL COMPUTATION OF THE MELTWATER VOLUME FROM THE SURFACE OF GLACIERS,
For primary bibliographic entry see Field 2C.
W77-06509

A SAMPLE COMPARISON OF THE GEOMORPHIC CHARACTER OF TWO RIVER BASINS AS RELATED TO SUSCEPTIBILITY TO BRIDGE FAILURE,
For primary bibliographic entry see Field 2E.
W77-06525

WATER RESOURCES AVAILABILITY, QUALITY, AND COST IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6D.
W77-06531

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6E.
W77-06534

HISTORICAL AND GEOGRAPHICAL EVOLUTION OF WATER LAW AND ITS ROLE IN THE MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
For primary bibliographic entry see Field 6E.
W77-06536

SUPPLEMENT TO FINAL ENVIRONMENTAL STATEMENT; HARRY S. TRUMAN DAM AND RESERVOIR.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 6B.
W77-06538

APPENDIX A - AS ORDERED BY THE COURT TO THE SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT HARRY S. TRUMAN DAM AND RESERVOIR OSAGE RIVER, MISSOURI.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 6B.
W77-06539

FLOOD CONTROL IN OKLAHOMA: AN EXAMPLE OF LAND USE PRECEDING LAND USE PLANNING,
Tulsa Univ., Okla. Coll. of Law.
G. B. Landman, J. F. Hicks, and T. W. Ihloff.
Oklahoma Law Review, Vol 29, No 1, p 16-64 (Winter 1976). 3 append.

Descriptors: *Flood control, *Flood plain zoning, *Oklahoma, *Flood protection, Legislation, Regulation, Zoning, Non-structural alternatives, Rivers, Streams, State governments, Federal government, Local governments, Governmental interrelations, Planning, Alternative planning, Floods.

Despite a massive federal protective program including 50 flood control projects, it is estimated that annual flood losses will steadily increase in Oklahoma. Since protective works tend to lure new development to flood plains and encourage it to remain, the answer lies in regulation and restriction of flood plain use. Also, emphasis must be given to land use around smaller streams, since these can become raging torrents during a heavy rain. The article reviews the federal government's role in flood plain zoning, and concludes that enabling statutes are insufficient. Some form of enabling legislation is needed to permit local government units to adopt flood control regulations. Most state legislatures have delegated some similar responsibility to local governments, and such legislation is needed in Oklahoma to avoid litigation from property owners. The author proposes a model flood control act for Oklahoma which would comply with the federal flood control programs. Adoption of a similar plan would make correction expenses unnecessary where adequate flood plain regulation would have prevented the problem. (Molloy-Florida)
W77-06542

THE WASHINGTON SHORELINE MANAGEMENT ACT OF 1971,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W77-06547

THE NAVIGABILITY CONCEPT IN THE CIVIL AND COMMON LAW: HISTORICAL DEVELOPMENT, CURRENT IMPORTANCE, AND SOME DOCTRINES THAT DON'T HOLD WATER,
International Business Machine, Armonk, N. Y.
For primary bibliographic entry see Field 6E.
W77-06553

FLOOD PLAIN INFORMATION: SOUTHWEST FOOTHILL STREAMS (EVANS, THOMAS, AND WHITES CREEKS AND SKYLINE WASH), RENO, NEVADA.
Army Engineer District, Sacramento, Calif.
Prepared for the Regional Planning Commission of Reno, Sparks and Washoe County. June 1974. 38 p, 13 fig, 29 plates, 6 tab.

Descriptors: *Nevada, *Floods, *Flood profiles, *Flood damage, *Flood plains, Overland flow, Flash flood, Overflow, Streamflow forecasting, Maximum probable flood, Cloudbursts, Peak discharge, Flood peak, Erosion, Deposition(Sediments), Bank erosion, Erosion control.
Identifiers: Evans Creek(NV), Whites Creek(NV), *Reno(NV), Skyline Wash(NV), Thomas Creek(NV), Debris, Standard Project Flood, Intermediate Regional Flood.

The study area extends from the southern part of Reno on the north to Steamboat Hills on the south. The creeks are tributaries of Steamboat Creek. Skyline Wash is tributary to Virginia Lake. Development is generally related to agriculture: ranchhouses, barns, irrigation and cropland. There is some commercial development and small residential areas are increaseing. Population is about 18,000 and is expected to reach 45,000 by the year 2000. Floods characterized by high peak flows of moderate duration can occur in the months October through March after prolonged heavy rainfall, and during summer after cloudbursts, when high peak flows, short duration and small volume result. Natural vegetation and debris and most of the bridges, culverts and flume crossings can obstruct floodflows. Little data are available on the streams. Descriptions of past events and similar watersheds were used for determination of future flood heights. Since 1861, 14 winter floods and 4 summer floods have been recorded. Agriculture, related facilities and residences have been damaged. In an Intermediate Regional Flood, peak stream discharges ranging from 700 cubic ft/sec on Skyline Was at Plumb Land to 3900 dfs on Thomas Creek are predicted, along with water velocities up to 10-15 ft/sec in the channels and 2-4 ft/sec in overbank areas. This flood would peak in 1-2 hrs and remain about flood stage up to 7 hrs. A Standard Project Flood would have peak discharges ranging from 900 cfs on Skyline Wash to 5,200 cfs on Thomas Creek and slightly higher water velocities. (Smith-North Carolina)
W77-06583

FLOOD PLAIN INFORMATION: REDWOOD RIVER AT MARSHALL, MINNESOTA.
Army Engineer District, St. Paul, Minn.
Prepared for the City of Marshall, December 1974. 33 p, 18 fig, 25 plates, 5 tab.

Descriptors: *Floods, *River flow, *Diversion structures, *Minnesota, Flood water, Flood flow, Overflow, Streamflow forecasting, Flood forecasting, Flood profiles, Historic floods, Flood data, Peak discharge, Flood peak, Erosion, Flood plains, Obstruction to flow, Levee.
Identifiers: *Redwood River(MN), Marshall(MN), Standard Project Flood, Intermediate Regional Flood.

Within the city limits of Marshall, a town of 10,000 with a projected population of 12,500 by the year 2000, the flood plain of the Redwood River is 90% developed primarily in residential, commercial and recreational uses. Outside the city, land is devoted to agriculture. Portions of Marshall and the adjoining areas are subject to flooding from the Redwood River which has a drainage area of 743 square miles, 250 sq mi of which is upstream from Marshall. Major floods generally occur in summer and spring resulting from high intensity rain. Stream gage records, since 1940, indicate the highest peak discharge occurred in 1969 at 5590 cubic feet per second. A flood and windstorm in 1947 caused $300,000 damage and a 1957 flood caused considerable damage when a peak discharge of 5,370 cfs was recorded. In an Intermediate Regional Flood (IRF) a peak discharge of 8,200 cfs is expected along with water velocities up to 10.58 feet per second in the channel and 2.27 ft/sec in the overbank area. This flood would rise to peak in 46 hours and last 174 hours above critical stage. During a Standard Project Flood a peak discharge of 15,200 cfs is predicted and water velocities slightly higher than the IRF. This flood would reach peak in 34 hours and remain 156 hours over bank. In the main channel most bridges are obstructive to flood flow in major floods; most bridges in the diversion channel (constructed in 1963) are not obstructive. Lumber stored in the flood plain may float downstream and obstruct bridge openings during flooding. (Smith-North Carolina)
W77-06584

FLOOD PLAIN INFORMATION: STONE, DARK AND KETTLE BROOKS, TOWN OF AUBURN, MASSACHUSETTS,
Army Engineer District, Waltham, Mass. New England Div.
Prepared for the Town of Auburn, MA., October, 1972. 30 p, 16 fig, 8 plates, 7 tab.

Descriptors: *Floods, *Flood stages, *Flow characteristics, *Flood plains, *Flood protection, *Planning, *Control structures, *Flood routing, Flood data, Flow duration, Diversion structures, *Massachusetts, Flood profiles.
Identifiers: Stone Brook(MA), Dark Brook(MA), Kettle Brook(MA), *Flood plain management, Auburn(MA), Worcester Diversion Project(MA), Worcester(MA).

Stone Brook slopes about 12.9 feet per mile to its confluence with Dark Brook which flows northeasterly, sloping at 6 ft/mi until it empties into Kettle Brook upstream of the Worchester Diversion Project, a concrete weir and tunnel which divert Kettle Creek flood flows around the city. Stone and Dark Brooks are flat, sluggish streams with numerous natural valley storage areas and man-made pounsa. Kettle Creek, largest tributary of Blackstone River, flows about 700 ft through the study area with a flat slope, draining 34 square miles. Pressures for development are increasing in the wide flood plains. Extensive filling in the flood plains of Dark and Stone Brooks have decreased the floodway area with resultant higher stages upstream and loss of natural storage capacity increasing flood potential downstream. Floods occur at all seasons, developing very quickly due to the small drainage area short time of concentration and last from one to two days. Hurricanes also effect the watershed. Most bridges and culverts obstruct flood flows. None of the three dams on the streams have flood storage cacity nor will any of them alter floodwater flows. No flood plain regulations exist, though the state has a dredge and fill ordinance which has some effect. After construction of the diversion project the largest flood occurred March 19, 1968 with an estimated peak discharge of 1,400 cubic feet per second on Kettle Creek, with 700 cfs on Dark Brook. An Intermediate Regional Flood and a Standard Project Flood would have estimated peak discharges of 3,400 cfs and 7,700 cfs, respectively, on Kettle Creek at Diversion Control Weir, 1,600 cfs on Dark Brook and 1,300 on Stone Brook. Channel velocities of from 1 to 5 ft/sec and 1 to 4 ft/sec overbank are expected. (Salzman-North Carolina)
W77-06585

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, ANDERSON AND OLINDA CREEKS, AND SPRING GULCH, ANDERSON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
Prepared for the City of Anderson and Shasta County, June 1975. 55 p., 29 fig., 15 plates, 8 tab.

Descriptors: *Floods, *Flood stages, *Flow characteristics, *Flood plains, *Flood protection, *Non-structural alternatives, Flow duration, Flood damage, Flood plain zoning, Dams, Levees, Flash floods, *California.
Identifiers: *Sacramento River(CA), Anderson Creek(CA), Olinda Creek(CA), Spring Gulch(CA), Anderson(CA), Intermediate Regional Flood, Standard Project Flood.

Ten miles of the Sacramento River and the lower reaches of its two tributaries, Spring Gulch and Anderson Creek with its tributary Olinda Creek are discussed. The Sacramento River drainage has about 1421 sq. mi. of rugged mountains and 5000 sq. mi. of high arid plateau. The creeks drain about 40 sq. mi. west of the river. Irrigation water is carried through central part of the study area by Anderson Creek. About 50% of the study area land is used for agriculture, 15% for urban uses, 30% vacant or rural homes with the remainder devcted to roads and utilities. By the year 2000 population of Anderson is expected to increase from the present 5500 to 8500 while rural areas will increase from 1500 to 2500. The intermittent streams have large and well-defined channels and are adequate to carry moderate flows. Flooding occurs due to major rainstorms, large controlled outflows from Shasta Lake and flash floods in late spring to early fall. Flows are characterized by high peaks of moderate duration. Flood damage reduction measures include structual control of the Shasta Dam and levees on Anderson Creek plus state and county flood plain regulations. The greatest flood occurred in January 1970 having a peak discharge of 157,000 cubic feet per second on the Sacramento River, causing extensive damage. In March and April 1974 intense rainfall created large floods in Shasta County. Anderson suffered some residential damage and prune orchards were wiped out. Anticipated peak flows for an Intermediate Regional Flood and a Standard Project Flood on the Sacramento River at Balls Ferry Bridge would be 148,000 and 332,000 cfs respectively. An IRF would inundate about 4060 acrs. Anderson Creek, with a peak discharge of 2500 cfs in an IRF and 2900 in an SPF, would inundate some commercial structures and spread overland. (Salzman-North Carolina)
W77-06586

FLOOD PLAIN INFORMATION: WAHOO CREEK, COTTONWOOD CREEK, DRY RUN CREEK AND SAND CREEK, WAHOO, NEBRASKA,
Army Engineer District, Omaha, Nebr.
Prepared for the City of Wahoo, NB, January 1971. 33 p, 12 fig, 9 plates, 6 tab.

Descriptors: *Floods, *Historic floods, *Flood plains, *Peak discharge, *Nebraska, *Flood profiles, Runoff, Flood stages, Flow characteristics, Flow duration, Flood protection, Planning, Levees, Channel improvement.
Identifiers: Wahoo Creek(NB), Cottonwood Creek(NB), Dry Run Creek(NB), Sand Creek(NB), Wahoo(NB), Intermediate Regional Flood, Standard Project Flood.

Wahoo Creek flows southerly through the study area sloping at 3.7 ft/mi with flood plains ranging from 2500 to 4000 ft wide. Sand Creek, Wahoo Creek's largest tributary, flows south, southeasterly for 4.5 miles. The stream bed has been straightened and has an average slope of 5.5 ft/mi. Cottonwood Creek's 1.8 miles, sloping at 3.7 ft/mi, have also had minor channel straightening. Dry Run Creek with a steep slope of 17.6 ft/mi has had 30% of its 2.7 miles straightened. The streams

together drain 475 sq. mi. The flood plains are relatively wide and flat containing primarily agricultural land with some commercial and residential buildings. Spoil from channel cleanout and flood deposits have raise stream banks slghtly above adjacent flood plains in some places. Floods result from intense rainfall during May through September and usually last less than one day. Flood controls include levees and channel straightening. Reservoirs on Sand and Dry Run Creek have been proposed. The greatest flood occurred in 1963 on Wahoo Creek when a peak discharge of 77,400 cubic feet per second was recorded. Flood damages in the bsin from a 1959 flood reached $1 million. Peak discharges for an Intermediate Regional Flood and Standard Project Flood are estimated to be 55,000 cfs and 114,000 cfs, respectively, on Wahoo Creek downstream of Sand Creek. Similar flood conditions would exist on other streams. Both an IRF and SPF will overtop some of the crossing of roads and railroad tracks that lie in the flood plains. (Salzman-North Carolina)
W77-06587

FLOOD PLAIN INFORMATION: LITTLE SIOUX RIVER, OCHEYEDAN RIVER AND MUDDY CREEK, CITY OF SPENCER AND VICINITY, CLAY COUNTY, IOWA,
Army Engineer District, Omaha, Nebr.
Prepared for Iowa Natural Resources Council, City of Spencer and Clay County, June 1971. 37 p, 15 fig, 14 plates, 7 tab.

Descriptors: *Floods, *Historic floods, *Flow duration, *Flood plains, *Flood protection, *Flood profiles, *Iowa, Runoff, Flood flow, Flood data, Flood stages, Peak discharges, Flow characteristics, Flood damage, Control structures, Snowmelt, Levees.
Identifiers: *Little Sioux River(IA), *Ocheydean River(IA), Muddy Creek(IA), Spencer(IA), Clay County(IA), Intermediate Regional Flood, Standard Project Flood.

Flowing eastwardly through a meandering channel with a slope of 1.3 feet per mile, the Little Sioux River drains 1,100 square miles and is joined by the Ocheyedan inside the city limits of Spencer and by Muddy Creek further downsteram. The drainage basin in moderately hilly to nearly level with many lakes, ponds and marshes and with flood plains varying from 700 feet to 7,000 feet wide. Cause of floods include snowmelt, rainfall runoff or combinations, and last from 1 to 6 days usually peaking in less than 1 day. The largest flood occurred on June 8, 1953 producing a discharge of 30,000 cubic feet per second and causing damages of $250,000. Flood control has been limited to emergency levee construction and temporary evacuation of certain residential areas. Obstructions to flood flow include 9 bridges and natural vegetation. although little development exists in the flood palin, an estimated Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) with discharges of 37,000 cfs and 91,000 cfs respectively on Little Sioux River at Muddy Creek could be expected to cause extensive damages. On Ocheyedan River from the upstream study limits to its mouth an IRF would dischare 29,500 cfs, the SPF would discharge 72,000 cfs. Muddy Creek from its upstream study limit to its mouth, would discharge 9,200 cfs for the IRF, 25,000 cfs for the SPF. Flood controls are not proposed; however, the report provides information to guide local official in identifying flood hazard areas and planning the use and regulation of flood plains. (Salzman-North Carolina)
W77-06588

FLOOD PLAIN INFORMATION: WHITE RIVER - KILLBUCK CREEK, MADISON COUNTY AND ANDERSON, INDIANA,
Army Engineer District, Louisville, Ky.
Prepared for the Madison County Commissioners, the City of Anderson and the Indiana Department of Natural Resources, September 1973. 30 p, 22 fig, 16 plates, 6 tab.

Descriptors: *Floods, *Flood flow, *Flood forecasting, *Historic floods, *Flow characteristics, *Flood protection, *Flood profiles, Flood data, Flood stages, Peak discharge, Flood plains, Planning, Levee, Obstructions to flow, *Indiana.
Identifiers: *White River(IN), Killbuck Creek(IN), Anderson(IN), Madison County(IN), *Flood plain management program, Standard Project Flood, Intermediate Regional Flood.

Portions of Anderson, the seat of Madison County 39 miles northeast of Indianapolis, is subject to flooding from the White River, a tributary of Wabash River, and Killbuck Creek. The White River, which drains 11,349 square miles, has broad flood plains 1400 to 3,20oo feet wide which have been developed for commercial, industrial, agricultural and residential purposes. The slope of the streams are moderate, 3.9 feet permile on the White River and 3.4 ft/mi on the 10 miles of Killbuck Creek in the study reach. Floods generally occur during winter and spring after intense rainfall. Floods are impeded by natura and man-made obstructions including 6 dams, 22 of 25 existing bridges, and lumber stored in the flood plains. Flood damage reduction measures are limited to a right-bank levee and several privately built levees in the residential area. Flood data collected from topographic maps, stream gages, and weather measurements, indcate the greatest recorded floods occurred in March 1913 on the White River with a peak discharge of 28,000 cubic feet per second, and April 1964 on the Killbuck Creek. In an Intermediate Regional Flood a peak discharge of 31,700 is expected and in a Standard Project Flood a discharge of 60,900 cfs is predicted on White River. Water velocities could be up to 12 ft/sec. The IRF would rise to peak in 36 hours and last 102 hours while the SPF would peak in 42 hours and remain 138 hours. (Salzman-North Carolina)
W77-06589

FLOOD PLAIN INFORMATION: OHIO RIVER, DEARBORN COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
Prepared for Lawrenceburg, Aurora and Dearborn County Planning Commission, January 1970. 38 p, 10 fig, 8 plates, 8 tab.

Descriptors: *Floods, *Peak discharges, *Flow duration, *Flood damage, *Flood plains, *Flood protection, *Control structures, *Reservoirs, *Flood profiles, Flood flow, Historic floods, Flood data, Flow characteristics, Levee, Flood walls, *Indiana.
Identifiers: *Ohio River(IN), Dearborn County(IN), Tanners Creek(IN), Hogan Creek(IN), South Hogan Creek(IN), North Hogan Creek(IN), Laughery Creek(IN), Intermediate Regional Flood, Standard Project Flood, Project Design Flood.

Flooding on 7.3 miles of the Ohio River flood plain and backwater overflows along Tanners Creek, Hogan and South Hogan Creeks, North Hogan and Laughery Creeks, is discussed. Dearborn County, on the right bank of the river, has intense urban development. Within the Lawrenceburg flood plain between the Ohio and Tanners Creek, development is protected by 18,300 feet of earth levee, 1,175 feet of concrete wall, 4 pumping plants, relief wells and drainage structures. Outside the levee the Indiana-Michigan Electric Corporation has constructed levees to protect its power generating and transformer stations. The Aurora flood plain of about 350 acres, of which about 310 acres are devoted to business and residential uses, extends along the river from mile 494.7 to mile 497.9 and along Hogan Creek. Main flood season is January through April, with floods resulting from heavy rains. Floods can last up to 12 days with a rate of rise of about .2 to .4 ft/hour. The greatest flood occurred in January 1937 when most of Lawrenceburg was flooded. Damages were over $7 million. In March 1945 flooding caused damages approaching $3 million. Greater floods may be anticipated in the future since studies show that shifts in storm position or the sequence of storm events over the Ohio River basin would result in greater flood discharges than those already experienced. Maps, profiles, and cross-sections show the extent and levels of Intermediate Regional Floods and Project Design Floods. Existing buildings outside the Lawrenceburg floodwall and within the Aurora floodway would obstruct flood flows. (Hufschmidt-North Carolina)
W77-06590

SPECIAL FLOOD HAZARD REPORT: SHIP CREEK, ALASKA.
Army Engineer District, Anchorage, Alaska.
Prepared for Greater Anchorage Area Borough, Alaska, June 1975. 12 p, 7 plates.

Descriptors: *Alaska, *Floods, *Flash flood, *Flood plains, Floodwater, Streamflow forecasting, Tides, Peak discharge, Erosion, Floodways, Snowmelt, Flood plain zoning.
Identifiers: *Ship Creek(AK), *Anchorage(AK), *Debris, Greater Anchorage Area Borough(GAAB).

The development along this stream varies from light to heavy industrial and is not changing rapidly because of past high density development. The drainage area is 115 sq mi at its confluence with Knik Arm and although the gradient is steep in the upper reaches, the stream flattens considerably as it flows into salt water at Anchorage. Most floods occur in Spring, Summer and Fall. In extremely cold winter temperatures stream waters can freeze down to the streambed, forcing water to the top of the ice until it is higher than the banks at which time a new watercourse is formed. In Spring, snowmelt and rain can cause flooding and in Summer, intense rain can cause flooding. The major source of flooding in lower Ship Creek is from extreme high tides which occur about every 19 years, reaching 19.2 feet. Damage is not high because these tides are predictable. Though 3 streamgages have been in operation on this creek for various lengths of time, little information is available on floods, so that other watersheds were used to determine likely floods. During an Intermediate Regional Flood a peak discharge of 2000 cubic feet per second and water velocities up to 10 ft/sec are expected. Overbank flow would generally be less than 3 ft/sec. Culverts on one road would be obstructive to a large flood and it is suggested that a responsible governing body make inspections to insure that culverts do not become blocked. Erosion is a potential problem along this creek, particularly around the culverts and railroad bridges. The maps of this report show a floodway design which has been calculated to pass an Intermediate Regional Flood. At present there are no flood control structures, but there is an existing borough zoning ordinance for flood damage reduction. (Smith-NC)
W77-06591

FLOOD PLAIN INFORMATION: SOUTH CREEK, NORTH CREEK, CATFISH CREEK, CLOWER CREEK, ELLIGRAW BAYOU AND MATHENY CREEK, SARASOTA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
Prepared for the Board of County Commissioners of Sarasota County, June 1973. 32 p, 14 fig, 10 plates, 6 tab.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood data, *Flood forecasting, *Flow duration, Runoff, Historic floods, Tides, Storms, Hurricanes, Flow characteristics, Flood frequency, Flood peak, Peak discharge, *Florida.
Identifiers: Sarasota County(FL), South Creek(FL), North Creek(FL), Catfish Creek(FL), Clower Creek(FL), Elligraw Bayou(FL), Matheny Creek(FL), Intermediate Regional Flood, Standard Project Flood.

The portion of central Sarasota County (population 120,413) covered by this report is subject to flooding from the creeks which have a combined total drainage area of about 35 square miles. The flood plains of these streams which drain into Dryman Bay and Little Sarasota Bay are sparsely developed with limited commercial, residential or agricultural uses. Increased development is expected in the flood plains however. Major floods result from rainfalls of varying duration at any time of the year but are most frequent from June to October. Bridges, culverts, and vegetation obstruct flood flows. Lower portions of the streams are subject to tidal flooding from the Gulf of Mexico. Four floods have occurred since 1960. The most damaging occurred in September 1962 when runoff from 16 inches of rain in 48 hours flooded 500 homes and did $2.3 million damage. The Intermediate Regional Flood and Standard Project Flood would have peak discharges on South Creek of 1,560 and 2,040 cubic feet per second respectively. Flooding during an IRF would inundate 42 developed acres. Channel and overbank velocities during IRF would be 2 to 12 feet and 1 foot per second respectively. An IRF resulting from rainfall would rise at the rate of .2 feet per hour and would be above critical stage for up to 4 days. The SPF would last up to 5 days. The Corps of Engineers has completed no flood reduction works, but some works described by the Sarasota Soil Conservation District may be completed soon. The County has some flood regulations. (Henley-North Carolina)
W77-06592

DISASTER ASSISTANCE (FLOOD MITIGATION).
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 398, Price codes: A20 in paper copy, A01 in microfiche. October 1970. 457 p, 88 fig, 12 tab.

Descriptors: *Flood data, *Flood forecasting, *Flash floods, *Warning systems, *Flood warning, *Information exchange, *Data collections, *Information retrieval, Floods, Flood control, Flood protection.
Identifiers: *North Atlantic Treaty Organization(NATO), *Disaster Assistance Project, *Disaster Information Center, *Atmospheric forecasting, *Automatic hydrological networks.

A Disaster Assistance Project was sponsored by the North Atlantic Council under the aegis of the Committee on the Challenge of Modern Society of the North Atlantic Treaty Organization (NATO). Flood experts and representatives from 12 NATO countries met in October 1970. Five panel discussions were conducted. Testimony was given of the flood control, warning and emergency procedures for each country, as well as analysis of rehabilitation operations and the roles of various public and private organizations in the event of a flood disaster. From this testimony recommendations for international cooperation were given by the chairmen: (1) By improving lower atmospheric forecasting and developing automated hydrologic networks, governments may more accurately forecast water levels in connection with flash flooding, river flooding and coastal flooding; this information could be shared with other NATO countries. (2) A NATO-established Disaster Information Center may provide exchange of historical, scientific and technical information, and possibly the exchange of scientific, technical and operational staff members among various NATO nations. (3) Coordination of international flood relief and assistance should facilitate the collection and dissemination of flood information and allow for further timely contributing assistance from NATO nations of flood experts and operational staff. (Gentry-NC)
W77-06593

PEOPLE AND THE SOUND. FLOOD DAMAGE REDUCTION.
Army Engineer District, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06598

INLAND LAKE DEMONSTRATION PROJECT,
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-06599

MANAGEMENT OF WATER AND RELATED LAND RESOURCES IN THE STATE OF MAINE,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06600

4B. Groundwater Management

PENNSYLVANIA USES LINERS TO CONTROL GROUND WATER CONTAMINATION FROM LANDFILL OPERATIONS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Solid Waste Management.
For primary bibliographic entry see Field 5G.
W77-06172

SEPTIC TANK POLLUTION CUT.
For primary bibliographic entry see Field 5D.
W77-06174

COAGULATION OF WATER WITH HIGH CONCENTRATION OF COLOR MATTER (OCZYSZCZANIE WODY O WYSOKIEJ BARWIE),
For primary bibliographic entry see Field 5G.
W77-06188

VEGETATION MANAGEMENT GUIDLINES FOR INCREASING WATER YIELDS IN A SEMIARID REGION: AN ARIZONA CASE STUDY,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-06238

RUNOFF POTENTIAL OF DESERT CATCHMENTS IN BIKANER DISTRICT,
Central Arid Zone Research Inst., Jodhpur (India).
R. C. Yadav, K. N. K. Murthy, and C. T. Abichandani.
Annals of Arid Zone, Vol. 15, No. 1 and 2, p 1-7, March and June, 1976. 4 tab, 4 ref.

Descriptors: *Groundwater recharge, *Rainfall-runoff relationships, *Water yield improvement, *Water storage, *Water harvesting, Water supply, Runoff, Surface runoff, Water yield, Rainfall, Precipitation(Atmospheric), Groundwater, Recharge, Arid lands, *Watershed management, *Estimating.
Identifiers: India.

A survey was made to quantify the runoff potential from desert catchments in an arid land zone of India. Daily rainfall data for the area for the months of July, August, and September from 1906 to 1952 were used for the estimation of daily runoff. The estimations were made by the United States Soil Conservation Service method which takes into account soils, vegetation, present land use, and antecedent moisture condition of the catchment. Runoff values for the entire rainy season were computed by taking individual daily runoff figures. The results are presented. Runoff and rainfall data were statistically analyzed and probability distribution presented. Rainfall data show that rainfall in the area is erratic. A comparison of runoff figures with rainfall figures indicates that there is no consistency in runoff-rainfall relationships. A comparison is made between the runoff potentials of the eroded rocky Kolayat catchment and the roded aggraded Nal catchment. Kolayat catchment can be exploited for runoff storage, reuse, and groundwater whereas the Nal catchment can be managed to utilize runoff for crop production in pockets with adoption of water harvesting practices during normal years and to provide for groundwater recharge in excessive flood years. (Jamail-Arizona)
W77-06246

QUALITY OF UNDERGROUND IRRIGATION WATER IN THE SEMI ARID TRACT OF AGRA DISTRICT,
Raja Balwant Singh Coll. (India). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 3C.
W77-06249

COMBINED USE OF GROUND AND SURFACE WATERS FOR IRRIGATION,
For primary bibliographic entry see Field 3F.
W77-06309

WATER QUALITY VARIATIONS FOR PUMPING WELLS,
Ground-Water Quality Consultant, Fresno, Calif.
For primary bibliographic entry see Field 5B.
W77-06310

AN INTEGRATED APPROACH TO DELINEATING CONTAMINATED GROUND WATER,
Berk and Ciaramella, Cranbury, N.J.
For primary bibliographic entry see Field 5B.
W77-06311

GROUND-WATER TURBIDITY RESULTING FROM ARTIFICIAL RECHARGE,
Agricultural Research Service, Fresno, Calif. Water Management Research; and Agricultural Research Service, Fresno, Calif. Western Region.
For primary bibliographic entry see Field 5B.
W77-06312

NITRATE AND CHLORIDE IN GROUND WATER UNDER IRRIGATED AGRICULTURE IN CENTRAL WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-06313

PROS AND CONS OF STORM WATER RECHARGE WELLS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5B.
W77-06324

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W77-06326

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W77-06327

EVALUATION OF ARSENIC CONCENTRATIONS IN THE TULPEHOCKEN CREEK BASIN,
Geological Survey, Harrisburg, Pa. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06330

LEACHATE PLUMES IN A HIGHLY PERMEABLE AQUIFER,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5B.
W77-06331

UTILIZING A DIGITAL MODEL TO DETERMINE THE HYDRAULIC PROPERTIES OF A LAYERED AQUIFER,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 2F.
W77-06333

WATER RESOURCES OF THE NORTH COAST LIMESTONE AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
E. V. Giusti, and G. D. Bennett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 769/As, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 42-75, February 1976. 42 p, 27 fig, 4 tab, 13 ref.

Descriptors: *Groundwater resources, *Karst hydrology, *Limestones, *Aquifer characteristics, Puerto Rico, Hydrologic data, Hydrogeology, Surface waters, Surface-groundwater relationships, Groundwater movement, Water yield, Water wells, Groundwater recharge, Hydrologic budget, Water quality, Chemical analysis.
Identifiers: *Puerto Rico(North coast limestone area).

The north-coast limestone area, about 600 square miles, is one of the few sparsely populated parts of Puerto Rico, and is the island's last large and underdeveloped source of ground water. The area's limestone aquifers are (from oldest to youngest): the Lares Limestone, the Cibao Formation, the Aguada Limestone, and the Aymamon Limestone. Only between Arecibo and Barceloneta have artesian aquifers (the Montebello Limestone Member of the Cibao Formation, and the upper Lares Limestone) been found. Wells along Highway 2 can be expected to yield a few hundred gpm. Wells in the water-table aquifers can be expected to yield 1,000 gpm in the upper Aymamon Limestone; in the lower Aymamon and Aguada Limestones yields range from 100 to 800 gpm, and in the Cibao Formation and Lares Limestone, from 100 to 200 gpm. (Woodard-USGS)
W77-06335

AVAILABILITY OF WATER SUPPLIES IN NORTHWEST GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06336

THE ALGEBRAIC TECHNOLOGICAL FUNCTION - A MECHANISM FOR INTEGRATING PHYSICAL AND ECONOMIC FACTORS IN GROUNDWATER MANAGEMENT,
Geological Survey, Reston, Va. Water Resources Div.
T. Maddock, III.
In: Proceedings of the 1974 Joint Automatic Control Conference, University of Texas, Austin, June 18-21, 1974: Published by the University of Texas, p 562-563, 1974.

Descriptors: *Model studies, *Groundwater, *Water management(Applied), Aquifer characteristics, Economic efficiency, Equations, Forecasting, Evaluation, Project planning.
Identifiers: *Groundwater management, Algebraic technological function.

Managing ground waters requires the ability to understand and to predict the effects of economic, political and hydrologic factors on water demand and production. Economic models based on microeconomic theory such as theory of the firm have been developed to aid in groundwater management. Sophisticated ground-water simulation models use diffusion-type partial differential equations with suitably defined initial and boundary conditions to predict an aquifer's response to stress (e.g., predict the drawdown due to the stress of pumping). Simulation models and economic models may be combined in management models through the use of an algebraic technological function (ATF). An ATF relates in a simple algebraic manner the relation between the stress and the behavior that stress produces in an aquifer as predicted by the simulation model. The stress and stress behavior are usually decision variables in the management model. An ATF example is presented. (Woodard-USGS)
W77-06339

PROPOSED WATER-SUPPLY INVESTIGATIONS IN SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W77-06340

WATER SUPPLY FOR THE ARRERO PILOT AREA OF THE NATIONAL RANGE DEVELOPMENT PROJECT, SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W77-06341

BRIEF SUMMARY OF THE HYDROGEOLOGY OF BANGLADESH,
Geological Survey, Reston, Va.
J. R. Jones.
Open-file report, April 1974. 12 p, 1 fig.

Descriptors: *Groundwater resources, *Foreign projects, *Aquifer characteristics, *Hydrogeology, Water wells, Water level fluctuations, Water yield, Water utilization, Groundwater recharge, Water resources development, Evaluation, Reviews, Asia.
Identifiers: *Bangladesh.

The average annual precipitation in Bangladesh ranges from about 50 inches in the west-central part to about 200 inches in the northeast. Most of the rain falls during the southwest monsoon so that local precipitation is heavy at the same time flood waters of the Brahmaputra and Ganges rivers arrive. The result is the most years about 50 percent of Bangladesh is inundated. Consequently, over much of the country the annual recharge to ground-water reservoir is large. Annual fluctuations of the groundwater level are commonly about 10 feet in the northern part of the country. If a storage coefficient of 0.2 is assumed, annual recharge may be about 24 inches of water. Although the amount of recharge is different from area to area, it is almost everywhere very substantial in the Ganges-Brahmaputra Delta. Groundwater conditions are described in four major hydrologic areas. (Woodard-USGS)
W77-06342

PESTICIDES DATA-COLLECTION ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN TEXAS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06344

WATER SUPPLY AND WASTE DISPOSAL, CULEBRA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico.
For primary bibliographic entry see Field 5E.
W77-06345

HYDROLOGIC RELATIONS BETWEEN LAKES AND AQUIFERS IN A RECHARGE AREA NEAR ORLANDO, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
W. F. Lichtler, G. H. Hughes, and F. L. Pfischner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 916/As, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-65, August 1976. 61 p, 27 fig, 3 tab, 5 ref.

Descriptors: *Surface-groundwater relationships, *Lakes, *Aquifers, *Groundwater movement, *Water balance, Hydrology, Rainfall, Evaporation, Overland flow, Seepage, Leakage, Water table aquifers, Artesian aquifers, Equations, Forecasting.
Identifiers: Orange County(Fla).

The three lakes investigated in Orange County, Florida, gain water from adjoining water-table aquifer and lose water to Floridan aquifer by downward leakage. Net seepage (net exchange of water between lake and aquifers) can be estimated by equation $S = AX + BY$, where S is net seepage, X represents hydraulic gradient between lake and water-table aquifer, A is lumped parameter representing effect of hydraulic conductivity and cross-sectional area of materials in flow section of water-table aquifer, Y is head difference between lake level and potentiometric surface of Floridan aquifer, and B is lumped parameter representing effect of hydraulic conductivity, area, and thickness of materials between lake bottom and Floridan aquifer. If values of S, X, and Y are available for two contrasting water-level conditions, coefficients A and B are determinable by solution of two simultaneous equations. If the relation between lake and groundwater level is the same on all sides of the lake--with regard to each aquifer--and if X and Y are truly representative of these relations, then X and Y terms of equation provide valid estimates of inflow to lake from water-table aquifer and outflow from lake to Floridan aquifer. (Woodard-USGS)
W77-06348

WATER IN CARBONATE ROCKS OF THE MADISON GROUP IN SOUTHEASTERN MONTANA--A PRELIMINARY EVALUATION,
Geological Survey, Billings, Mont. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06349

THE GEOTHERMAL PLANT AT AHUACHAPAN IN EL SALVADOR AND ITS POSSIBLE EFFECTS ON THE WATER QUALITY ON THE BORDER RIVER- RIO PAZ BETWEEN EL SALVADOR AND GUATEMALA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5B.
W77-06382

ATTENUATION OF POLLUTANTS IN MUNICIPAL LANDFILL LEACHATE BY CLAY MINERALS: PART 1-COLUMN LEACHING AND FIELD VERIFICATION,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-06395

CHEMICAL DYNAMICS OF A CONFINED LIMESTONE AQUIFER,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.

For primary bibliographic entry see Field 2F.
W77-06399

GEOTHERMAL ENERGY PUMP AND MONITOR SYSTEM,
Sperry Rand Corp., New York. (Assignee).
H. B. Mattews.
U.S. Patent No. 3,988,896, 10 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, no 1, p 56, November 2, 1976.

Descriptors: *Patents, *Monitoring, *Geothermal studies, *Data transmission, Thermal studies, Instrumentation, Electric power production, Remote sensing, Equipment, Pumps.

The operation of a geothermal well power-generation system is monitored by sensor, communication, and performance, and performance monitoring equipment permanently associated with the operating power generation system. Sensors detect changes in well water temperature, in water pressure below and above the pump, and in pump rotating speed. This data is transmitted by multiplex communication to receiver and utilization means at the earth's surface. A permanent magnet generator sytem supplied the signal representative of pump rotation speed and also supplies electrical power for the multiplex communication of the sensor output signals. (Sinha-OEIS)
W77-06443

WATER RESOURCES AVAILABILITY, QUALITY, AND COST IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6D.
W77-06531

TRIBUTARY GROUND WATER AND CHANGE-OF-PLACE-OF-USE RULES IN DESIGNATED GROUND WATER BASINS IN COLORADO.
University of Colorado Law Review, Vol 45, No 2, p 229-47 (Winter 1973).

Descriptors: *Colorado, *Groundwater, *Water wells, *Legislation, Groundwater basins, Water sources, Groundwater movement, Base flow, Subsurface flow, State governments, Water allocation(Policy), Planning, Well permits, Regulation, Tributaries, Groundwater potential, Groundwater resources, Water rights, Irrigation, Prior appropriation, Constitutional law, Legal aspects.

The Colorado Ground Water Management Act was enacted in 1965 by the Colorado General Assembly to regulate the economic development of designated ground water resources. A recent Colorado case supported this effort, upholding the Act's provisions for determination of water-right priorities and transfer approval for the place of use of water. The article discusses the constitutionality of the Act as applied to tributary ground water, the Act's delegation of judicial powers to an administrative body, the application of change-of-place-of-use rules to designated ground water, and the inclusion of tributary ground water in a designated ground water basin. The legal distinctions between tributary ground water and nontributary ground water are outlined in light of the engineering question of whether there is such a thing as nontributary ground water. Unresolved legally is whether some tributary ground water may be included within a designated ground water basin. Change of place of use under the Act follows traditional guidelines, and would be permitted when the rights of other appropriators were not injured. Vested prior appropiations are protected under the Act. (Molloy-Florida)
W77-06545

PROTECTION OF UNDERGROUND DRINKING WATER SUPPLIES - THE GONZALEZ AMENDMENT TO THE SAFE DRINKING WATER ACT,
Openheimer, Rosenberg, Kelleher, and Wheatley, Inc., San Antonio, Tex.
For primary bibliographic entry see Field 5G.
W77-06548

4C. Effects On Water Of Man's Non-Water Activities

MODEST TECHNIQUES.
For primary bibliographic entry see Field 6G.
W77-06237

INORGANIC POLLUTION FROM FORESTS AND RANGELANDS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 5B.
W77-06239

FLOOD CONTROL IN OKLAHOMA: AN EXAMPLE OF LAND USE PRECEDING LAND USE PLANNING,
Tulsa Univ., Okla. Coll. of Law.
For primary bibliographic entry see Field 4A.
W77-06542

4D. Watershed Protection

RUNOFF AND EROSION,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
W. C. Boughton.
In: Watershed Management on Range and Forest Lands, Proceedings of the Fifth Workshop of the U.S./Australia Rangelands Panel, Boise, Idaho, June 15-22, 1975, p117-122, March 1976. 2 tab, 31 ref.

Descriptors: *Runoff, *Erosion, *Rainfall-runoff relationships, *Erosion control, *Australia, Water yield, *Watershed management, Flood control, Soil conservation, Land clearing, Groundwater recharge, Floods, Vegetation effects.

Studies in Australia are used to review topics including water yield of catchments, floods, erosion and erosion management. A few years of unoff records are sufficient to establish a rainfall-runoff relationship, to estimate either the temporal pattern of water yield from a catchment or long-term frequency distribution of floods. Problems being studied on experimental catchments there include the effects of clearing, changes in tree species, and soil conservation works. Where large areas of native bush have been cleared for conversion to pasture or crop, increase occur in total runoff from catchments or in the amount of groundwater recharge. In South Australia, a limestone country where surface runoff is slight, large areas of pine plantation have replaced open grassland, drastically reducing areas of pine plantation have replaced open grassland, drastically reducing groundwater recharge from through-drainage in those areas. Floods resulting from cyclonic storms entail large volumes of runoff, often 250-500 mm. Soil conservation measure are discussed, including those after fires. (Jahns-Arizona)
W77-06236

VEGETATION MANAGEMENT GUIDLINES FOR INCREASING WATER YIELDS IN A SEMIARID REGION: AN ARIZONA CASE STUDY,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 3B.
W77-06238

INORGANIC POLLUTION FROM FORESTS AND RANGELANDS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 5B.
W77-06239

INLAND LAKE WATERSHED ANALYSIS,
Michigan Univ., Flint. Dept. of Physical Geography.
For primary bibliographic entry see Field 5G.
W77-06356

MAINE LAKE WATER QUALITY STRATEGY.
Maine Dept. of Environmental Protection, Augusta.
For primary bibliographic entry see Field 5C.
W77-06357

PROCEEDINGS OF THE CONFERENCE ON NONPOINT SOURCES OF WATER POLLUTION: PROBLEMS, POLICIES AND PROSPECTS.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-06396

EFFECTS OF STREAM CHANNEL IMPROVEMENTS ON DOWNSTREAM FLOODS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2A.
W77-06397

THE INFLUENCE OF BOGS ON THE DISTRIBUTION OF STREAMFLOW FROM SMALL BOG-UPLAND CATCHMENTS,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
E. S. Verry, and D. H. Boelter.
In: Hydrology of Marsh-Ridden Areas. Proceedings of UNESCO Symposium, Minsk, Belorussian SSR, June 1972. Studies and Records in Hydrology 19, p. 469-478, The Unesco Press, Paris, 1975. 4 fig, 1 tab, 15 ref.

Descriptors: *Streamflow, *Hydrology, Watersheds(Basins), United States, Perched water, Groundwater, Watershed management, Flow, Distribution, *Bogs, Wetlands.
Identifiers: *Streamflow distribution, *Peatlands, *Bog-upland catchments, Perched bog.

The distribution of flow from small bog-upland catchments is governed primarily by the hydrogeological relationships; organic soils in the bog part of the catchment have only a minor effect. The seasonal distribution of flow from groundwater bogs is fairly uniform due to base flow from the groundwater basin. Flow from perched bogs is primarily concentrated in the spring and results from snowmelt and early spring rains. Maximum annual stream flow peaks from both types of catchment usually result from snowmelt and are a function of the water content of the snowpeak and rain on snow rather than the hydrogeological relationship of the bog. Both types of bogs provide short-term regulation of storm-flow resulting from rainfall by reducing peaks and delaying the release of storm flow volumes. (Forest Service)
W77-06440

A SAMPLE COMPARISON OF THE GEOMORPHIC CHARACTER OF TWO RIVER BASINS AS RELATED TO SUSCEPTIBILITY TO BRIDGE FAILURE,
For primary bibliographic entry see Field 2E.
W77-06525

PEOPLE AND THE SOUND. EROSION AND SEDIMENTATION,
Army Engineer District, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06596

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ANALYSIS OF LEAD IN POLLUTED COASTAL SEAWATER,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
C. Patterson, D. Settle, and B. Glover.
Marine Chemistry, Vol. 4, No. 4, p 305-319, December, 1976. 2 fig, 4 tab, 15 ref.

Descriptors: Analysis, *Lead, Water pollution, *Water pollution sources, *Sea water, Sewage effluents, Algae, Plankton, Runoff, Heavy metals, *Pollutant identification, Analytical techniques.

Total lead concentrations in sea water were determined in sewage-polluted coastal waters and in ordinary coastal waters. Stable isotope dilution mass spectrometric techniques, under laboratory conditions, were used to make determinations in sea water samples. Average concentrations were about 25 ng/kilogram in surface water of ordinary coastal waters and 150 ng/kilogram in highly polluted sea water samples. Filtrate lead levels (0.4 microns) were equivalent to lead extracted by dithizone in chloroform from untreated sea water. Particle lead was 39% to 56% of total lead in polluted water. The proportions increased with increased amounts of sewage. In non-polluted water, lead was associated with plankton. One-third total lead (one-half particle lead) adheres to the water container walls during the first day. After three months, the remaining particle lead can be collected from the surface of algal colonies growing on the container walls. Wall adsorption does not substantially affect concentrations of freely available lead in sea water. The 206Pb/207Pb ratio determined was considered an indication of the non-mixing of lead from two different pollution sources: rainstorm runoff and sewage lead. (Collins-FIRL)
W77-06159

VOLUMETRIC DETERMINATION OF GREASE IN WASTEWATER,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
R. B. Maxcy.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2809-2811, December, 1976. 2 tab, 6 ref.

Descriptors: *Pollutant identification, *Volumetric analysis, *Analytical techniques, *Lipids, *Oil, Laboratory tests, Evaluation, Analysis, Waste water treatment, *Waste disposal.
Identifiers: *Grease.

Grease is an important factor in waste disposal problems. The effect of the contributing source and grease removal procedures were evaluated. The traditional determination methods are time-consuming. A simplified method for grease determinations that was developed involved adding ethanol and trichlorotrifluoroethane (TTE) to the sample in a separatory funnel. The TTE is removed and glass beads are added to induce a gentle boil. The TTE volume is reduced by evaporation on a hot plate and the TTE containing the grease is quantitatively transferred to a Babcock skim milk bottle by rinsing with separate TTE portions. Glass beads are added and a water bath is used to raise the bottle temperature to 100C to evaporate the TTE to apparent dryness. The bottle is exposed to vacuum and cooled. Na3PO4 is added and the bottle is again warmed. The bottle is swirled to suspend the grease and cooled to room temperature. Steps are taken to bring the solution into the capillary. Then the mixture is centrifuged, warmed, and again centrifuged. A greasy column which is measurable should be formed at this point. Comparison with standard test procedures indicated that this method should provide an empirical method for routine effluent monitoring from municipal sewage treatment facilities. (Collins-FIRL)
W77-06160

SIMULTANEOUS AUTOMATED DETERMINATION OF CHLORIDE, NITRITE, NITRATE, AND AMMONIA IN WATER AND WASTE WATER,
New York State Dept. of Health, Albany. Environmental Health Center.
E. Canelli.
Water, Air, and Soil Pollution, Vol. 5, No. 3, p 339-348, April, 1976. 4 fig, 1 tab, 11 ref.

Descriptors: Analysis, Analytical techniques, *Colorimetry, *Water analysis, *Chlorides, Mercury, *Nitrites, *Nitrates, *Ammonia, Nitrogen compounds, Chemical reactions, *Pollutant identification.
Identifiers: Automated mercury (II) thiocyanate method, Indophenol blue method.

Multichannel automated analysis and optimization of automated system parameters have been combined to produce an automated system for simultaneous determination of chloride, nitrite, nitrate, and ammonia in water and waste water. Advantages of this system include optimized reaction conditions for direct application to natural and waste water samples; a 40% reduction in necessary time for analysis; a need for only 2 milliliters of sample and the inclusion of continuous filtration with minimum sensitivity loss and peak separation; total inorganic nitrogen measurement independent of interconversions with the three nitrogen forms; and the option of determining dissolved organic nitrogen as a mixture of ammonia, nitrite, and nitrate N after UV irradiation. The method is based on modifications of established colorimetric procedures. Chloride is determined by the automated mercury (II) thiocyanate method with the concentration of reagents in reaction mixture increased to maximize signal intensity and linearity and the dilution line omitted to improve precision at concentrations lower than 50 ppm Cl. The indophenol blue method of ammonia analysis was used with altered sample-to-reagent ratios. Nitrite was determined as an azo dye and nitrate was reduced and determined as nitrite. Detection limits were 1 ppm Cl for chloride and 1, 5, and 5 ppb N for nitrite, nitrate, and ammonia. (Collins-FIRL)
W77-06161

EVALUATION OF GAUZE PAD METHOD TO RECOVER VIRUSES FROM WATER,
Hadassah Medical School, Jerusalem (Israel).
B. Fattal, and E. Katzenelson.
Water Research, Vol. 10, No. 12, p 1135-1140, 1976. 9 tab, 12 ref.

Descriptors: Evaluation, Analysis, *Viruses, *Separation techniques, Sewage effluents, Water quality, Laboratory tests, On-site investigations, Water pollution sources, *Waste water treatment, *Sampling, *Pollutant identification.
Identifiers: *Gauze pad method, Grab sample method.

The gauze pad method was evaluated as a means of virus recovery from water. This method was compared with the grab sample method for concentration and detection of viruses from sewage. Laboratory and field studies were conducted for the two methods. The tests compared virus detection by the two methods; compared the number of viruses in gauze pads in sewage for 24 hours against those kept 3,4, and 7 days at the same time; determined the effect of repeated elutions and the effect of calf serum on elution recovery efficiency from gauze pads; studied the recovery efficiency of gauze for viruses in water; and determined the effect of a sample volume on virus recovery efficiency. Results indicated that gauze left in sewage for 24 hours contained 90 times the viruses found in the sewage, suggesting some concentrating ability. The grab sample method was selective in the concentration of all enteroviruses and had low recovery efficiencies for sewage-contained enteroviruses. The gauze pad was advantageous for continuous, long-term sampling, but is limited by being qualitative, and only about 1% of the viruses in water can be recovered by this method. No advantage was found in immersing the pad for more than 24 hours. Recovery efficiency using gauze pads for viral concentrations from tap water is very low and dependent upon sample volumes. The larger pads have lower efficiencies. Adding calf serum to the wash fluid did not affect elution of viruses from pads immersed in tap water. Two washings of the pad removes more than 70% of the total virus recoverable after 5 elutions in either tap water or sewage. (Collins-FIRL)
W77-06183

DETERMINATION OF NON-IONIC SURFACE ACTIVE SUBSTANCES IN THE WATER SOLUTIONS (OZNACZANIE NIEJONOWYCH SUBSTANCJI POWIERZCHNIOWO-CZYNNYCH W ROZTWORACH WODNYCH),
Z. Gorzka, A. Jozwiak, and A. Socha.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 44-51. 3 fig, 2 tab.

Descriptors: *Pollutant identification, *Aqueous solutions, *Colorimetry, Analysis, *Analytical techniques, *Polarographic analysis, Industrial wastes.
Identifiers: *Surface active substances, Roksol IT, Stremid DK, Comperlan KD.

The application of a new polarographic method for determining non-ionic surface active substances (SAS) was investigated. Tests were conducted with three commercial preparations, Roksol IT, Stremid DK, Comperlan KD, and industrial wastes with Roksol IT in 0.01 to 5% concentrations. Polarographs used were the OH 101 (Hungarian) and the LP 60 (Czechoslovakian). Colorimetric determinations of SAS were made simultaneously. The polarographic method was proved very convenient in determining non-ionic SAS in aqueous solution of the tested preparations and industrial wastes. This is especially true when applied to serial determinations. (Collins-FIRL)
W77-06191

CONCERNING THE ARTICLE OF S. D. ZAUGOL'NIKOV, M. M. KOCHANOV, A. O. LIOT AND I. I. STAVCHANSKII, 'FORECASTING THE HAZARD OF ORGANIC COMPOUNDS IN THE ENVIRONMENT', (IN RUSSIAN),
Z. I. Zholdakova.
Gig Sanit 9, p 92-94, 1975.

Descriptors: *Solubility, *Organic compounds, Water pollution, Pollutant identification, Environment, Ecosystems, *DDT, *Pesticide residues, *Path of pollutants, Indicators.
Identifiers: *Solubility index(Pollutants).

Use of the solubility index for evaluating the hazard of pollutants in water bodies is discussed. In complex surface water ecosystems, the stability of a substance and its propensity to accumulate in aquatic organisms are more substantial indices of hazard and solubility. DDT is practically insoluble in water but its stability and cumulative properties make it a most hazardous pesticide. (See W76-11734)--Copyrigh 1976, Biological Abstracts, Inc.

W77-06195

EFFECTS OF WASTE DISCHARGES ON WATER QUALITY OF THE SOUTH PLATTE RIVER, DENVER METROPOLITAN AREA,
National Field Investigations Center-Denver, Colo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 936, Price codes: A06 in paper copy, A01 in microfiche. EPA Report, Denver, Colorado, June, 1972. 118 p, 5 fig, 12 tab, 8 ref, 4 append.

Descriptors: *Water quality, *Water pollution abatement, *Water treatment, Biochemical oxygen demand, Suspended solids, Chemical oxygen demand, Carbon, Nitrogen, Phosphorus, Heavy metals, *Pollutant identification, *Colorado, Rivers.
Identifiers: *South Platte River(Colo), *Denver area(Colo).

A study of the South Platte River Basin was conducted to determine whether established state and federal water quality standards were being met. Fifteen treatment plants were studied to determine whether treatment meeting established requirements had been effected, to determine the extent of water quality improvement, and to determine any recommendations which might be made. Influent samples were collected and analyzed for BOD, total and suspended solids, volatile suspended solids, settleable solids, total organic carbon, chemical oxygen demand, nitrogen series, total phosphorus, and selected heavy metals. Final effluent samples from the Denver Metro facility were analyzed for total and fecal colforms. Field measurements and residual chlorine were measured at the time of collection. (Collins-FIRL)
W77-06199

A WATER QUALITY STUDY OF THE UPPER CLARK FORK RIVER AND SELECTED TRIBUTARIES,
Environmental Protection Agency, Denver, Colo. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 921, Price codes: A05 in paper copy, A01 in microfiche. EPA Report, Denver, Colorado, September, 1972. 83 p, 2 fig, 8 tab, 5 append.

Descriptors: *Rivers, *Tributaries, *Water quality, *Pollutant identification, *Water quality standards, Water pollution, Water pollution sources, Chemical analysis, Bioindicators, Heavy metals, *Montana, Public health.
Identifiers: Clark Fork River(Mont).

A study was conducted to determine the water quality of the Clark Fork River, Montana, and to set standards for concentrations of heavy metals due to heavy mining in the area. Basic methods consisted of water quality sampling and biological evaluations in the reach from Warm Springs to Drummond, Montana, and selected tributaries. Results revealed a stretch of severe pollution indicated by a deficient and non-balanced population of benthic organisms and an almost non-existent fish population. Another area with opposite conditions was found healthy. Downstream from Drummond, the stream supports significant sportfishing activity. Most heavy metals pollution was traced to the settling tanks of one major mining, milling, and smelting operation. The high concentrations decrease downstream and these wastes caused 'cementing' of a portion of the river bottom by the precipitation of gypsum and metallic hydroxides in settling pond discharges. Chemical and biological conditions indicate high water quality in tributaries. Recommendations were made for metals levels. It was suggested that the state upgrade the classification of a certain reach of the river through appropriate action. Tests are necessary to determine the degree of an indicated potential lead health hazard. (Collins-FIRL)
W77-06200

QUALITY OF UNDERGROUND IRRIGATION WATER IN THE SEMI ARID TRACT OF AGRA DISTRICT,
Raja Balwant Singh Coll. (India). Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 3C.
W77-06249

RAPID COLORIMETRIC ANALYSES OF CATIONIC AND ANIONIC SURFACTANTS,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
L. K. Wang, and D. F. Langley.
In: The 1975 New England Water Works Association Meeting, January 16, 1975, Waltham, Massachusetts. 24 p, 9 fig, 17 ref, 2 append.

Descriptors: *Pollutant identification, Analytical techniques, *Colorimetry, *Surfactants, *Freshwater, Dyes, Color reactions, Spectrophotometry, Adsorption.
Identifiers: *Cationic surfactants, *Anionic surfactants.

A new, more rapid colorimeteric method applicable to the analysis of either anionic or cationic surfactants in fresh water at low concentrations is introduced. A dye reacts with ionic surfactant and forms a chloroform-soluble, colored complex in the presence of chloroform. The color intensity of the chloroform layer is proportional to the concentration of the dye-ionic surfactant complex, and can be measured spectrophotometrically. Methyl orange is used for cationic surfactants, azure A or methylene blue for anionic surfactants. The method is stoichiometric and can be performed in a very short period of time. The advantages of the new colorimetric method over the standard methylene blue method and standard carbon adsorption method include its time-saving procedures and suitability for cationic surfactant analysis. Its advantages over a two-phase titration method include its more rapid procedure and more accurate surfactant measurement below one mg/liter. It is suitable for field analyses of ionic detergent-type impurities in water and waste water, provided that a portable colorimetric instrument is available. (Snyder-FIRL)
W77-06251

THE DETERMINATION OF TRACE METALS IN CLADOPHORA GLOMERATA -- C. GLOMERATA AS A POTENTIAL BIOLOGICAL MONITOR,
Queen's Univ., Kingston (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-06257

THE USEFULNESS OF LYNMAEA STAGNALIS AS A BIOLOGICAL INDICATOR IN TOXICOLOGICAL BIO-ASSAY (MODEL SUBSTANCE ALPHA-HCH),
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Toxicology.
For primary bibliographic entry see Field 5C.
W77-06262

HEAVY METALS IN ANIMALS FROM THE NORTH EAST COAST,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06271

METAL CONTENT OF DENDROBAENA RUBIDA (OLIGOCHAETA) IN A BASE METAL MINING AREA,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
M. P. Ireland.
OIKOS, Vol. 26, p 74-79, 1975. 2 fig, 3 tab, 24 ref.

Descriptors: *Annelids, *Worms, Animal physiology, *Metals, *Iron, *Zinc, *Lead, *Soil chemical properties, *Calcium, Biochemistry, Bioassay, Alkaline earth metals, *Mine wastes, Soil analysis, Soil tests, Absorption.
Identifiers: *Dendrobaena rubida, *Tissue analysis, Bioregulation, Bioaccumulation, Uptake.

Metal analysis of soils collected near unused lead and zinc mines showed high concentrations of total iron, zinc, lead and free iron. Field and experimental studies on the metal content of the earthworm Dendrobaena rubida living in soils of high and low metal levels, revealed that the earthworms probably regulated the iron and zinc content of their tissues but retained lead. Soil calcium was suggested to be an influence in the uptake of metals by D. rubida. The results for tissue lead content appeared to show a direct effect of calcium on lead by the regulation of endogenous tissue calcium. (Katz)
W77-06272

A WATER-POWERED MECHANICAL DEVICE FOR ACCURATELY SUBSAMPLING LARGE NUMBERS OF NEKTONIC ORGANISMS,
Southwest Research Inst., Houston, Tex.
G. M. Hightower, K. T. Kimball, and C. A. Bedinger, Jr.
Transactions of the American Fisheries Society, 1976(4), p 509-513, 2 fig, 3 tab.

Descriptors: *Laboratory equipment, *Sampling, Laboratory tests, *Methodology, Testing procedures, *Nekton, Homogeneity, Reliability, Statistics, Quality control, Data collections, On-site-investigation, *Zooplankton, *Pollutant identification.
Identifiers: Subsampling.

A subsampling machine is described which uses a large volume of water to randomly distribute estuarine nektonic collections into 12 equal portions. Samples weighing 4.5 kg to 30.0 kg with fish from 20 to 150 mm standard length can be accurately subsampled in a circular, 76-cm high, 76-cm diameter galvanized tub which employs a slighty smaller internal rotating partitioned basket and nine water jets (six in the bottom and three around the side) for sample mixing and partitioning. Water uplift and manual basket rotation followed by settling results in an accurate random subsample as indicated by chi-square testing. (Katz)
W77-06276

THE IDENTIFICATION OF PHOSPHORUS AS A GROWTH LIMITING NUTRIENT IN LOUGH NEAGH USING BIOASSAYS,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
M. P. Parr, and R. V. Smith.
Water Research, Vol. 10, p. 1151-1154, 1976. 3 fig., 4 tab., 16 ref.

Descriptors: *Algae, *Nutrients, *Essential nutrients, *Nutrient requirements, *Phosphorus, *Chlorophyta, *Cyanophyta, *Bioassay, Growth rates, Metals, Iron, Nitrogen, Wastes, Water pollution sources, Laboratory tests, Lakes.
Identifiers: *Selanastrum capricornutum, *Aphanizomenon flos-aquae, *Oscillatoria redekei, *Lough Neagh(Northern Ireland).

Algae were used in monthly bioassays of Lough Neagh water to evaluate nutrient limitation. Blue-green algae were limited by chelated iron; but once this limitation was overcome both nitrogen and phosporus were necessary to produce a large growth response. The green alga Selenastrum showed a low requirement for chelated iron. Addition of phosphorus was necessary in all biossays for prolonged algal growth, confirming the strategy of removing phosphorus from sewage effluents to reduce algal levels in the Lough. (Katz)
W77-06289

BIOCONCENTRATION OF XENOBIOTICS IN TROUT BILE: A PROPOSED MONITORING AID FOR SOME WATERBORNE CHEMICALS,
Medical Coll. of Wisconsin, Milwaukee. Dept. of Pharmacology.
For primary bibliographic entry see Field 5C.
W77-06294

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD, AND COPPER. II. RELATIONSHIP OF METALS IN THE MUSSEL TO THOSE DISCHARGED BY INDUSTRY,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06296

EXPERIMENTAL VERIFICATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION ON METHYL AND BUTYL ESTERS OF METHACRYLIC ACID IN WATER BODIES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W77-06299

WATER QUALITY VARIATIONS FOR PUMPING WELLS,
Ground-Water Quality Consultant, Fresno, Calif.
For primary bibliographic entry see Field 5B.
W77-06310

AN INTEGRATED APPROACH TO DELINEATING CONTAMINATED GROUND WATER,
Berk and Ciaramella, Cranbury, N.J.
For primary bibliographic entry see Field 5B.
W77-06311

GROUND-WATER TURBIDITY RESULTING FROM ARTIFICIAL RECHARGE,
Agricultural Research Service, Fresno, Calif. Water Management Research; and Agricultural Research Service, Fresno, Calif. Western Region.
For primary bibliographic entry see Field 5B.
W77-06312

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W77-06326

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 7C.
W77-06327

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, SOUTHWEST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06328

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, NORTHWEST AND ARCTIC SLOPE, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-06329

AVAILABILITY OF WATER SUPPLIES IN NORTHWEST GEORGIA,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-06336

IMPROVED EXTRACTION OF CHLOROPHYLL A AND B FROM ALGAE USING DIMETHYL SULFOXIDE,
Geological Survey, Doraville, Ga. Water Resources Div.
W. T. Shoaf, and B. W. Lium.
Limnology and Oceanography, Vol 21, No 6, p 926-928, November 1976. 1 fig, 1 tab, 9 ref.

Descriptors: *Chlorophyll, *Plant pigments, *Aquatic algae, *Solvent extractions, *Separation techniques, Diatoms, Phytoplankton, Periphyton, Chrysophyta, Chlorophyta, Cyanophyta, Estimating equations, Pollutant identification, Spectrophotometry.
Identifiers: *Chlorophyll determination, *Dimethyl sulfoxide.

Dimethyl sulfoxide (DMSO) and 90% acetone extracted equal amounts of chlorophyll from diatoms and blue-green algae, but DMSO was superior to 90% acetone for all green algae tested giving 2-60 times more chlorophyll depending on the species. The absorbance spectra of pure chlorophyll a (and b) from 600 nm to 750 nm were identical whether dissolved in 90% acetone or mixture of DMSO and 90% acetone (1:1 v/v). Thus, several equations for estimating chlorophyll concentration based on extraction in 90% acetone are applicable with this solvent. (Woodard-USGS)
W77-06337

METHODS FOR THE DETERMINATION OF INORGANIC CONSTITUENTS IN WATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-06338

PESTICIDES DATA-COLLECTION ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN TEXAS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06344

WATER IN A LIMESTONE TERRANE IN THE BOWLING GREEN AREA, WARREN COUNTY, KENTUCKY,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06347

WATER IN CARBONATE ROCKS OF THE MADISON GROUP IN SOUTHEASTERN MONTANA--A PRELIMINARY EVALUATION,
Geological Survey, Billings, Mont. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06349

ATTITUDES OF PROFESSIONALS IN WATER MANAGEMENT TOWARD THE USE OF WATER QUALITY INDICES,
American Bar Foundation, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W77-06353

1976 MINNESOTA WATER QUALITY INVENTORY: REPORT TO CONGRESS SECTION 305 (B).
Minnesota Pollution Control Agency, Minneapolis.
Minnesota Div. of Water Quality Report April 1976. 139 p. 10 fig., 3 tab.

Descriptors: *Water pollution control, *Comprehensive planning, *Minnesota, *Water quality standards, *Rivers, Watershed management, Federal Water Pollution Control Act, Water management(Applied), Multiple-purpose projects, Planning, State jurisdiction, River basin development, *Lake Superior, *Mississippi River, Estimated costs.
Identifiers: FWPCA 1972 Amendments, Mississippi River mainstem, *Minnesota River(Minn), *Rainy River(Minn), *Red River of the North(Minn).

Water quality conditions of 26 rivers plus Lake Superior are assessed for 1975 in a report mandated by Section 305 (b) of the 1972 Federal Water Pollution Control Act Amendments. The rivers are grouped and described according to 11 basin planning areas designated for PL 92-500 Section 303 (e) planning. Data for 13 significant water quality parameters is presented and compared with applicable state water quality standards. Plots of river mile versus concentrations of pollution are also given for four major rivers: the Mississippi, the Minnesota, the Red River of the North and the Rainy. Although most of the rivers in Minnesota are conforming to existing standards, six rivers are currently not in compliance with certain aspects of national interim goals of the 1972 legislation pertaining to fishing and/or swimming aspects of recreation. Assuming current funding of existing grant programs, only three of these six rivers will be able to comply with the interim goals by the target date of 1983. Violations of water quality standards caused by point-source pollution can be expected to be eliminated by the target date. However, even if all industrial and municipal point sources are brought into compliance, non-point loadings will continue to cause and contribute to many water quality problems in Minnesota. Ten substantive operational recommendations are made in the report. (Harris-Wisconsin)
W77-06355

MERCURY LEVELS IN THE RIVERS OF WESTERN CANADA 1970-1976.
Dept. of the Environment, Ottawa (Ontario). Water Quality Branch.
Social Science Series No 16, 1976. 23 p, 13 ref.

Descriptors: *Mercury, *Rivers, *Canada, Water pollution sources, Monitoring, Maps, Distribution, Public health, Data collections.
Identifiers: Vanadium pollution, Manitoba(Canada), Sasketchewan(Canada), Alberta(Canada), British Columbia(Canada), Yukon(Canada), Northwest Territories(Canada).

As part of a report that illustrates changes in mercury concentrations in major waters of western Canada since 1970, maps and overlays of Manitoba, Saskatachewan, Alberta, British Columbia and the Yukon-Northwest Territories show river mercury levels and mean levels for the highest recorded year where such a reading was higher than current levels. A large-scale map of all of western Canada indicates factors associated with the presence of mercury: areas of agricultural production, of average and intensive wheat production, mineral bodies geochemically associated with mercury, pulp and paper mills, chlor-alkali plants, and high levels of vanadium, the last of which was by far the largest source of inadvertent mercury emissions. Most vanadium in the rivers is believed to come from natural seepage and erosion of petroleum and bituminous deposits, with further contributions from hydrocarbon extracting and processing. Since monitoring began in 1970, there has ben a marked reduction in mercury concentrations in the rivers. Much of the rejuction in mercury concentrations in the rivers is attributed to federal and provincial initatives in regulating chlor-alkali plants, banning mercurial seed dressings, and enforcing improved housekeeping

in industry. Man-induced mercury releases into the aquatic environment are considerably smaller than those from natural sources, and little further improvement can be expected. In areas of high sedimentation, the new relatively mercury-free sediments should gradually bury the contaminated layers and eventually eliminate the threat of benthic bioaccumulation of mercury.
W77-06363

BLACK AND WHITE EPISODES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
C. Brosset.
Report B 295, June 1976. 30 p, 7 fig, 7 tab, 14 ref.

Descriptors: *Fallout, *Air pollution, *Aerosols, *Sulfates, *Nitrites, *Nitrates, Acidity, Alkalinity, Distribution, Particle size, Water pollution sources, Foreign countries.
Identifiers: *Sweden.

'Black and white episodes' describes situations when high concentrations of either dark or colorless particles of airborne pollution are transported in over Sweden. Dark particles containing ammonium sulfate and nitrate and characterized by slight acidity, are occasionally accompanied by increased concentrations of sulfur dioxide and nitrogen dioxide. These particles originate frm over the European continent to the south. White episodes are characterized by small particles consisting mainly of acid ammonium sulfates, probably formed photochemically over the North Sea during dry and sunny weather. Air flowing into Sweden from the north contains low particles concentrations, consisting mainly of chloride and neutral ammonium sulfate. The acidification problems and other effects on the environment through deposition or washout of these particles are discussed. The particles transported from the Atlantic contain much less chloride than those from the north, are much more acid, and also contain sulfate and some nitrate. The relatively high concentrations of Continental black particles contain carbonaceous material, sulfates and nitrate, and are more acid than the Atlantic particles. The sulfate concentration of fine particles occurring in black episodes appears to be formed through catalytic oxidation of sulfur dioxide, with subsequent neutralization of the resulting sulfuric acid by nitrates in the air. The mechanism for the formation of the nitrate concentration in the coarse particles and its possible relation with the high nitrite concentrations occurring during black episodes, is unclear. (Auen-Wisconsin)
W77-06364

PRELIMINARY REPORT ON THE POLYCHLORINATED BIPHENYLS IN THE MISSISSIPPI RIVER AND LAKE PEPIN.
Minnesota Pollution Control Agency, Minneapolis. Water Quality Div.
August 1975. 12 p, 2 fig, 3 tab.

Descriptors: *Polychlorinated biphenyls, *Mississippi River, *Fish, *Minnesota, *Wisconsin, Carp, Suckers, Walleye, Bullheads, Buffalo fish, Channel catfish, Bass, Pikes, Sauger, Drums, Pesticide residues, Lakes, Rivers.
Identifiers: *PCB bioaccumulation, Lake Pepin(Wis), St Croix River(Minn), Lake St Croix(Minn), Minnesota River(Minn), Shorthead redhorse, Black crappie, Sheephead.

Data is reported on concentrations of polychlorinated biphenyls (PCB) in fish in the Mississippi River from Monticello, Minnesota to Alma, Wisconsin, its tributary St. Croix and Minnesota rivers, and in Lake St. Croix and Lake Pepin. PCB values in individual fish ranged from 0.03 to 33.0 ppm. Sample size, average length, average weight, average percent fat, average PCB content and standard deviations for percent fat and PCB content are listed by species. The PCB level of fish is highly correlated with the percent fat content of the fish. Excluding those species with less than nine individuals sampled, the species with the higher concentrations of PCBs, in order of content, were white bass, carp, and channel catfish while lower concentrations of PCBs were generally found in walleye, sauger, smallmouth bass and black crappie. The data indicates that individual fish of a species may have more than twice the average PCB value or less than half the aveage PCB level for the species. Although some individual fish in three species had PCB levels exceeding the 5 ppm FDA limit, the weighted average or composite value was less than 5 ppm for each species. (Auen-Wisconsin).
W77-06370

STANDARD PROCEDURES FOR BIOLOGICAL EVALUATION.
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
(1974). 30 p, 43 ref.

Descriptors: *Analytical techniques, *Methodology, *Sampling, Phytoplankton, Chlorophyll, Zooplankton, Benthos, Invertebrates, *Maine, Ecosystems, Food chains, Food pyramids.

To facilitate analysis of aquatic ecosystems, procedures are detailed by the Maine Department of Environmental Protection for sampling phytoplankton, chlorophyll analysis, zooplankton and benthic macroinvertebrates. Details are given for phytoplankton sample collection, sample preservation and labeling, sample cell counting by the filtration method and taxonomic identification by the inverted microscope method, and methods for reporting results. Guidelines for chlorophyll determinations include sampling methods, filtration, type of reagent to be used and methodology, and calculations by comparing optical extinctions of three wavelengths. Instructions for zooplankton relate to sample collection and analysis by taxonomic genera. Sampling procedures for benthic macroinvertebrates, as point or non-point pollution indicators, include stream and lake sampling methods, site selection and frequency, sample preservation, labeling, faunal analysis, quantification and determination of diversity, as well as reporting procedures. (Auen-Wisconsin).
W77-06374

CHEMICAL DYNAMICS OF A CONFINED LIMESTONE AQUIFER,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Physics.
For primary bibliographic entry see Field 2F.
W77-06399

THE QUANTITATIVE CYTOCHEMICAL EFFECTS OF THREE METAL IONS ON A LYSOSOMAL HYDROLASE OF A HYDROID,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5C.
W77-06403

THE ACCUMULATION OF MERCURY IN FISHES REARED IN THE SEA WATER CONTAMINATED BY SUSPENDED SOLIDS CONTAINING MERCURY, (IN JAPANESE),
Environmental Research Center, Inc., Yokohama (Japan).
For primary bibliographic entry see Field 5C.
W77-06404

TOXICITY OF THE HERBICIDES DINOSEB AND PICLORAM TO CUTTHROAT (SALMO CLARKI) AND LAKE TROUT (SALVELINUS NAMAYCUSH),
Fish and Wildlife Service, Jackson, Wyo. Fish-Pesticide Research Lab.
For primary bibliographic entry see Field 5C.
W77-06412

RESISTANCE OF ADULT SOCKEYE SALMON TO ACUTE THERMAL SHOCK,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
For primary bibliographic entry see Field 5C.
W77-06413

MOVEMENT OF RAINBOW TROUT ACROSS A METALIMNION DEFICIENT IN DISSOLVED OXYGEN,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
For primary bibliographic entry see Field 5C.
W77-06417

COMPARISON OF STOMACH CONTENTS AND CONDITIONS OF TWO CATFISH SPECIES LIVING AT AMBIENT TEMPERATURES AND IN A HEATED DISCHARGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. R. Stauffer, Jr., J. H. Wilson, and K. L. Dickson.
The Progressive Fish-Culturist, vol. 38, no. 1, p. 33-35, 1976. 1 tab, 14 ref.

Descriptors: *Fish diets, *Fish food organisms, *Catfishes, *Channel catfish, *Fish physiology, Effluents, Heated water, Environmental effects, Laboratory tests, *Water temperature, Metabolism, Pollutant identification.
Identifiers: *Flathead catfish, *Pylodictus olivaris, Fish stomachs, Tissue analysis, Diversity index.

The stomach contents and condition of the young-of-the-year of two catfish species (Ictalurus punctatus and Pylodictus olivaris) living at the ambient river temperature (26.7 degrees C) and at their final field temperature preference (34.4 degrees C) in a heated discharge were compared. There were significantly more taxa and a higher diversity index value in stomachs from the reference site than in the stomachs from the heated site. However, there was a greater number of organisms in the stomachs of fish from the heated site. (Katz)
W77-06418

PRECISION LIVE-FEEDER FOR FLOW-THROUGH LARVAL CULTURE OR FOOD CHAIN BIOASSAYS,
Environmental Research Lab., Gulf Breeze, Fla.
L. H. Bahner, and D. R. Nimmo.
The Progressive Fish-Culturist, Vol. 38, No. 1, p. 51-52, 1976; 2 fig, 5 ref.

Descriptors: *Design, Research and development, *Bioassay, *Design flow, Shrimp, Fish diets, Path of pollutants, Monitoring, Data collections, Food chains, Aquiculture, *Laboratory equipment, Laboratory animals.
Identifiers: *Feeders, *Flow-through cultures, *Food chain, *Bioassay.

An inexpensive automatic feeder that featured precise timing of a wide choice of food delivery periods and time intervals between food delivery was described. The feeder, which also controlld simultaneous delivery of foods, was suitable for delivering toxicant-laden live foods, and was compatible for use in flow-through systems. A study was undertaken using the feeder to quantify the accumulation of a toxicant by animals feeding on nauplii of brine shrimp (Artemia salina) containing toxicant in a flow-through system. (Katz)
W77-06420

USE OF THE ASIATIC CLAM, CORBICULA LEANA PRIME, IN TOXICITY TESTS,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
R. M. Burress, and J. H. Chandler, Jr.

The Progressive Fish-Culturist, Vol. 38, No. 1, p. 10, 1976.

Descriptors: *Mollusks, *Clams, *Bioindicators, *Toxicity, Testing toxins, Laboratory tests, Path of pollutants, Laboratory animals, Water pollution effects, Monitoring.
Identifiers: *Asiatic clam, *Bioaccumulation, *Tolerance, Corbicula leana.

The use of the Asiatic clam, Corbicula leana, was found to be suitable for long-term toxicity tests. The clams survived well in both static and flow-through toxicity tests conducted over a wide range of water qualities and temperatures, and required no food during exposures lasting several weeks. (Katz)
W77-06423

PORTABLE, HAND-OPERATED CYCLE SIEVE FOR WASHING MACROINVERTEBRATE SAMPLES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 7B.
W77-06424

DEVELOPMENT AND EVALUATION OF ON-SITE TOXICITY TEST PROCEDURES FOR FISHERY INVESTIGATIONS,
Southeastern Fish Control Lab. Fish and Wildlife Service, Warm Springs, Ga.
R. M. Burress.
Investigations in Fish Control, No. 68, p. 1-8, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Methodology, *Research and development, *Toxicity, *On-site tests, *Bioassay, Ponds, Surface waters, Sampling, Design, Testing, Path of pollutants, Environmental effects, Investigations, Water quality, Testing procedures, Aquiculture, *Pollutant identification.
Identifiers: Antimycin, Bioaccumulation.

A simple, inexpensive procedure was developed for conducting on-site tests (bioassays) of the toxicity of various concentrations of antimycin on target and nontarget fishes in waters to be treated. After preliminary laboratory experiments with seven types of containers showed that large polyethylene bags were best for use in field toxicity tests, year-round field experiments were performed in ponds. Measurements of water quality in large bags containing 284 liters of water were closely similar to water quality measurements in ponds throughout the test periods. The maximum safe loading level for 96-h tests at temperatures above 18.3 C was bout 852 g of fish per bag, but this amount could be increased in colder water or in shorter tests. Final modifications and evaluations of the method were made on the basis of treatments of ponds with antimycin in accordance with data derived from on-site tests. The procedure described is adaptable for tests of many other chemical compounds commonly used by fishery workers. (Katz)
W77-06428

RECORDING BIOELECTRIC ACTION POTENTIALS OF MARINE DECAPOD CRUSTACEA BY REMOTE ELECTRODES: A BIOASSAY PROCEDURE FOR MONITORING HYDROCARBON POLLUTION,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
B. Idoniboye-Obu.
Environmental Pollution, Vol. 12, p. 159-166, 1977. 1 fig, 1 tab, 39 ref.

Descriptors: *Crustaceans, *Pollutant identification, Water pollution sources, Animal physiology, *Bioassay, *Methodology, *Testing procedures, *Bioindicators, Water quality, Laboratory tests, Analytical techniques, Research and development, *Oil, *Oil pollution, *Water pollution effects, *Commercial shellfish.
Identifiers: Tissue analyses, Palaemonetes pugio, Carcinus maenas, Libinia emarginata, Cancer irroratus, Homarus americanus, *Decapod crustaceans.

A method using electrodes on aquatic animals without injury to the animals for purposes of yielding bioelectric action potentials was developed. The method was applied to record gross muscle action potentials in crustaceans in freshwater and distilled water, where the obliterating effects of ions in seawater were not interfering. However, it was found that, provided the bioelectric generator or experimental animal was active and powerful enough, readable action potentials could be picked up by suitable non-polarishing electrodes even in seawater. Motor behavior of mechanically unimpeded animals was suggested for use as a bioindicator to determine lethal concentrations of water soluble hydrocarbons and oil pollutants. (Katz)
W77-06430

BIOLOGIC HALF-LIFE OF ENDRIN IN CHANNEL CATFISH TISSUE,
Fish and Wildlife Service, Marion, Ala. Southeastern Fish Cultural Lab.
For primary bibliographic entry see Field 5C.
W77-06432

LEAD AND FRESHWATER FISHES: PART 1-LEAD ACCUMULATION AND WATER PH,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-06435

PREFERRED TEMPERATURE OF FISH: A NEW METHOD,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering; and Toronto Univ. (Ontario). Dept. of Zoology.
R. Muller, and F. E. J. Fry.
Journal of the Fisheries Research Board of Canada, Vol 33, p 1815-1817, 1976. 2 fig, 7 ref.

Descriptors: *Water temperature, Laboratory equipment, *Testing procedures, Freshwater fish, Sunfishes, Laboratory tests, Methodology, Fish behavior, Fish physiology, Pollutant identification.
Identifiers: *Vertical temperature gradient, *Body temperature(Fish), *Pumpkinseed, Lepomis gibbosus, Acclimation, *Preferred temperature(Fish).

A simple apparatus for establishing a short, steep vertical temperature gradient is described. The preferred temperature is found by determining the mean body temperature of fish in such a gradient. Preferred temperatures at various acclimation temperatures for a sample of young pumpkinseed, Lepomis gibbosus, are given. (Katz)
W77-06438

OIL SLICK SAMPLING APPARATUS AND METHOD,
Calspan Corp., Buffalo, N.Y. (Assignee).
R. E. Baier, and A. Wright.
U.S. Patent No. 3,988,932, 4 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol. 952, no 1, p 68, November 2, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Sampling, *Water pollution sources, *Pollutant identification, Equipment, Surfactants.
Identifiers: Oil slicks.

Various laboratory techniques are used to identify characteristic constituents of oil slick samples in an attempt to locate the potential sources of oil discharge. A key element in the identification process is the collection of an adequate sample of the oil slck. This invention provides and apparatus and method which employs a substantially annular hoop like frame adapted to float on water and surround the slick. It has an inner surface coasted with a surface active material which functions by spreading to compress the area of the oil slick. In one embodiment the frame is hollow and has one or more openings to collect the oil slick as it is compressed by the inwardly spreading area of the surface active coating. (Sinha-OEIS)
W77-06444

MERCURY IN WATERFOWL FROM EASTERN CANADA,
New Brunswick Fish and Wildlife Branch, Fredericton.
P. A. Pearce, I. M. Price, and L. M. Reynolds.
Journal of Wildlife Management, Vol 40, No 4, p 694-703, 1976. 2 fig, 3 tab, 25 ref.

Descriptors: *Wildlife, *Waterfowl, *Birds, *Metals, *Mercury, *Ducks(Wild), Path of pollutants, Animal physiology, Mode of action, Black duck, Lesser Scaup duck, Mallard duck, Common Goldeneye duck, Common teal, Game birds, Hunting, Bioassay, Laboratory tests, Water pollution sources, Environmental effects, *Canada.
Identifiers: *Bioaccumulation, *Tissue analysis, Dabbling ducks, Diving ducks, Anas rubripes, Aythya affinis, Anas platyrhynchos, Anas discors, Bucephala clangula.

Average wet-weight concentrations of total mercury were 0.15 and 0.31 ppm in breast muscle of 146 dabbling (Anatinae) and 61 diving ducks (Aythyinae) from 21 sites in eastern Canada sampled prior to the 1970 hunting season and during the 1971 season. Concentrations exceeded 0.5 ppm in only a few samples, mostly taken near known industrial sources of mercury contamination. In 128 pooled samples of muscle from the wings of 1,480 ducks harvested in 13 regions during the 1970 season, mercury concentrtion averaged 0.13 ppm in both dabblers and divers. A highly significant relationship between mercury levels in wing muscle and those in breast muscle was found in black ducks (Anas rubripes) and lesser scaups (Aythya affinis). Ducks collected in 1971 and 1972 from the Wabigoon-English River watershed in northwestern Ontario were highly contaminated, extreme concentrations of 9.43, 9.10 and 14.7 ppm being noted in the breast muscle of the mallard (Anas platyrhynchos), blue-winged teal (A. discors) and common goldeneye (Bucephala clangula), respectively. There was a suggestion that ducks collected within 80 km of the industrial source of mercury at Dryden had higher residues than those collected farther downstream. (Katz)
W77-06463

SURVIVAL RATE AND OXYGEN CONSUMPTION OF JUVENILE WILD CARP MAINTAINED UNDER DIFFERENT CONDITIONS,
For primary bibliographic entry see Field 5C.
W77-06467

TRANSPORT PATHWAYS OF POLYCHLORINATED BIPHENYLS IN ATLANTIC WATER,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W77-06469

DEGRADATION OF PHENOLIC COMPOUNDS DOWNSTREAM FROM A PETROLEUM REFINERY COMPLEX,
Institut National de la Recherche Scientifique, Rimouski (Quebec).
For primary bibliographic entry see Field 5B.
W77-06470

TOTAL MERCURY RESIDUES IN LIVERS AND EGGS OF OLDSQUAWS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
For primary bibliographic entry see Field 5C.
W77-06471

RESEARCH RELATED TO BIOLOGICAL EVALUATION OF COMPLEX WASTES,
Environmental Research Lab.-Duluth, Minn.
W. B. Horning, II.
Biological Monitoring of Water and Effluent Quality, ASTMSTP 607, p 191-198, 1977. 15 ref.

Descriptors: *Pollutant identification, Effluents, *Methodology, *Analytical techniques, *Testing, Discharge(Water), Waste water(Pollution), Industrial wastes, Environmental effects, Evaluation, Assay, Quality control, Water control, Water pollution, Sources, Sampling, Testing procedures, On-site tests, Toxicity.

The development, testing and field verification of various tests for measuring the environmental impact of effluents of variable and unknown composition, especially those meeting the effluent guidelines, were presented. These included short lethal tests, short nonlethal tests, tests that estimated safe concentrations, behavior tests, tainting tests, and measurements of chemical groups relatable to residue formation and toxicity. These tests were to be made available for use by dischargers to monitor their effluents and for use as discharge permit requirements. Some of the major problems involved in biologically evaluating complex effluents were discussed. (Katz)
W77-06476

TRACE METALS IN MUSSELS FROM THE N.W. MEDITERRANEAN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, and B. Oregioni.
Marine Pollution Bulletin, Vol 7, No 2, p 26-29, 1976. 1 fig, 3 tab, 18 ref.

Descriptors: *Trace elements, *Mussels, *Metals, *Seasonal, Metabolism, Absorption, Bioindicators, Bioassay, Bodies of water, Water pollution sources, Animal physiology, Environmental effects, Path of pollutants, *Metals, *Pollutant identification.
Identifiers: Mytilus galloprovincialis, *Mediterranean Sea, Bioaccumulation, *Trace metals.

A coastal survey in the northwest Meditarranean region was initiated to measure existing levels of selected trace metals in mussels. For most metals the highest values were found in samples from port cities and areas in the vicinity of river discharge. Marked seasonal variation for many metals was evident; an overall increase in metal concentration in mussels from most stations during March 1974 was attributed to high precipitation and attendant run-off rather than to local pollution. Data comparison indivated that average metal levels in northwestern Mediterranean mussels did not differ markedly from those measured in similar species from different localities throughout the world. (Katz)
W77-06479

RETENTION AND EXCRETION OF 203HG-LABELLED METHYLMERCURY IN RAINBOW TROUT,
Helsinki Univ. (Finland). Dept. of Radiochemistry.
For primary bibliographic entry see Field 5C.
W77-06480

EFFECT OF SPRING FLOODS ON WATER ACIDITY IN THE KIIMINKIJOKI AREA, FINLAND,
Oulu Univ. (Finland). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W77-06481

COMBINED TOXICITY OF FREE CHLORINE, CHLORAMINE AND TEMPERATURE TO STAGE I LARVAE OF THE AMERICAN LOBSTER HOMARUS AMERICANUS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W77-06482

TRACE METALS IN CHOROMYTILUS MERIDIONALIS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
For primary bibliographic entry see Field 5C.
W77-06485

PCBS IN N.W. MEDITERRANEAN COASTAL WATERS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-06488

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, Minn.
J. E. Poldoski, and G. E. Glass.
National Bureau of Standards Special Publication 422, p 1073-1088, 1976. 6 fig, 4 tab, 25 ref.

Descriptors: *Analytical techniques, Design, *Methodology, *Sediments, *Trace elements, *Lake sediments, Sampling, Water quality, Water analysis, On-site data collections, *Lake Superior, Lakes, Pollutant identification.
Identifiers: *Anodic stripping voltammetry, Flameless atomic absorption.

Trace element measurements on western Lake Superior water were taken as a function of geographical area and distance above and below the water-sediment interface. The objective of detecting gradients of certain constituents in the system, however, required an extensive examination of required methodology. Investigations of this methodology indicated that the values obtained from a particular sample type are constrained by a number of uncertainties and operational definitions. Data were taken using different methods and experiments were conducted at various points in the analytical scheme to determine the influence of sample collection, handling and analysis steps. Results were of aid in determining where emphasis should be placed to improve the end result. (Katz)
W77-06489

IN VIVO ACCUMULATION OF RADIOACTIVE POLONIUM BY THE GIANT KELP MACROCYSTIS PYRIFERA,
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Marine Radioactivity Lab.
For primary bibliographic entry see Field 5C.
W77-06490

EFFECTS OF IRANIAN CRUDE OIL ON THE RED SEA OCTOCORAL HETEROXENIA FUSCESCENS,
Hebrew Univ., Jerusalem (Israel). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-06494

SIMULATION OF PO4-P BALANCE IN A SHALLOW AND POLLUTED RIVER,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
For primary bibliographic entry see Field 5B.
W77-06497

DETERMINATION OF ALKYL BENZENESULFONATE IN WATER BY U.V. METHOD,
Gunma Research Centre for Environmental Science, Maebashi (Japan).
M. Uchiyama.
Water Research, Vol. 11, No. 2, p 205-207, 1977. 6 fig, 1 tab, 5 ref.

Descriptors: *Pollutant identification, *Alkylbenzene sulfonates, *Analytical techniques, *Surfactants, *Water analysis, *Detergents, Surface tension, Foaming, Soaps, Wetting, Water pollution sources, Analysis, Colorimetry, Gas chromatography, Photometry, Chemistry, Separation techniques.
Identifiers: *Ultraviolet method, *Surfactant determination, *Wetting agents, Methylene blue complexes, Anionic surfactants, Extraction, Environmental pollution.

Alkyl benzenesulfonates in water were determined by the ultraviolet (u.v.) method. Alkyl benzenesulfonates in water were extraceted by 1,2-dichloroethane as methylene blue complexes, and, after being isolated from methylne blue by washing with concentrated hydrochloric acid, were extracted by water from 1,2 dichloroethane solution. Alkyl benezenesulfonate solutions were measured by absorbance at 222 nm. This band is characteristic of benzene and alkyl benzenesulfonates separated from other anionic surfactants. (Henley-ISWS)
W77-06498

BENTHIC INFAUNA AND MAINTENANCE DREDGING: A CASE STUDY,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2J.
W77-06499

CHLORINE-CONTAINING PESTICIDES AND POLYCHLORINATED BIPHENYLS IN BRITISH COASTAL WATERS,
Liverpool Univ. (England). Dept. of Oceanography.
R. Dawson, and J. P. Riley.
Estuarine and Coastal Marine Science, Vol. 5, No. 1, p 55-69, January 1977. 4 fig, 8 tab, 27 ref.

Descriptors: *Pesticide residues, *Pollutant identification, *On-site investigations, *Sea water, Sampling, Water samples, Surface waters, Oceans, Polychlorinated biphenyls, DDT, Testing procedures, Air, Sediments, Suspended solids, Analytical techniques, Foreign countries, Data collections.
Identifiers: *Irish sea, *North sea, *English Channel, *Firth of Clyde, *England, *River Wyre.

Gas chromatographic procedures have been developed for the determination of PCBs, DDT residues (Sigma DDT), and dieldrin in seawater, marine sediments, and marine air. In order to minimize contamination, chlorinated hydrocarbons were concentrated from seawater in situ using a towed 'fish'. Sampling was carried out in 1974 in the eastern Irish Sea, the Firth of Clyde, northern Scottish coastal waters, the English Channel, and North Sea. Concentrations of PCBs in areas subject to least pollution averaged about 0.2 ng/l, a value considerably lower than that found by most previous workers, which may reflect a continuation of the decline in their surface concentration reported by Harvey et al., (1974). The chromatograms of the PCB concentrates from all these areas closely matched that of Aroclor 1254. Higher concentrations (up to 1.5 ng/l) were found in the Clyde Estuary, Liverpool Bay, and the North Sea, particularly in the vicinity of sludge dumping areas; and the chromatograms of samples from such areas often matched that of Aroclor 1260. The levels of Sigma DDT in the English Channel and northern Scottish waters ranged from below detection level (less than 0.01 ng/l) to 0.03 ng/l. Samples from the Liverpool Bay area

and the mouth of the River Wyre were considerably higher (about 0.2 ng/l); such samples were also the richest in dieldrin (0.04-0.3 ng/l), which was usually at, or below, the detection limit (0.01 ng/l) in samples from offshore areas. Determinations of chlorinated hydrocarbons were carried out on sediments and suspended particulates from the Irish Sea; in general, the levels of chlorinated hydrocarbons in the particulates were considerably higher than those in the sediments. A limited number of estimations were carried out on marine air. These estimations showed the presence of 0.2-0.8 ng PCBs/cu m, usually matching a mixture of Aroclor 1254 and 1242. (Humphreys-ISWS)
W77-06501

MANGANESE CYCLING IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5B.
W77-06502

APPLICATION OF THE DIACETYL-MONOXIME THIOSEMICARBAZIDE METHOD TO THE ANALYSIS OF UREA IN ESTUARINE SEDIMENTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Microbiology.
J. P. Nakas, and C. D. Litchfield.
Estuarine and Coastal Marine Science, Vol. 5, No. 1, p 143-150, January 1977. 4 fig, 1 tab, 13 ref. NSF GA-32440.

Descriptors: *Ureas, *Assay, *Estuaries, *New Jersey, Estuarine environment, Methodology, Analytical techniques, Testing procedures, Sediments, Water pollution sources, Analysis, Seasonal, Nitrogen compounds, Colorimetry, *Pollutant identification, Coasts, Evaluation, Bays.
Identifiers: Diacetyl-monoxime thiosemicarbazide method, *Raritan-Sandy Hook Bay(NJ).

A new method for the analysis of urea in marine sediments using diacetylmonoxime and thiosemicarbazide in the presence of strong acid resulted in a sensitive and highly reproducible assay regardless of sediment type. The occurrence and distribution of urea in estuarine sediments off the New Jersey coast were monitored in an attempt to discern the importance of this compound as a combined source of nitrogen. From mid-1972 through the end of 1973, urea levels were detected which did not exceed 32.8 microgram urea N/g dry sediment. Continued sampling through 1974 revealed significantly higher urea concentrations (greater than 400 microgram urea N/g dry sediment), while the total nitrogen present remained constant. Also, a fairly regular seasonal pattern was observed, with higher urea levels found in winter and lower levels occurring in spring-summer. These results may indicate a change to a more polluted ecosystem. (Humphreys-ISWS)
W77-06505

EFFECT OF CRYOGENIC PROCESSES ON THE FORMATION OF SODIUM BICARBONATE WATERS,
Irkutskii Gosudarstvennyi Universitet (USSR).
For primary bibliographic entry see Field 2K.
W77-06507

CALIFORNIA CURRENT EDDY FORMATION: SHIP, AIR, AND SATELLITE RESULTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-06523

ON THE CHARACTERISTICS AND CIRCULATION OF THE SOUTHWESTERN ATLANTIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-06524

WATER RESOURCES AVAILABILITY, QUALITY, AND COST IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 6D.
W77-06531

5B. Sources Of Pollution

KINETICS AND MECHANISM OF OXIDATION OF HYDROGEN SULFIDE BY HYDROGEN PEROXIDE IN ACIDIC SOLUTION,
Minnesota Univ. Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5D.
W77-06158

ANALYSIS OF LEAD IN POLLUTED COASTAL SEAWATER,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
For primary bibliographic entry see Field 5A.
W77-06159

THE KINETICS OF BIOOXIDATION IN A CONTINUOUS ACTIVATED SLUDGE PROCESS (KINETYKA PROCESU CIAGLEGO BIOUTLENIANIA OSADEM CZYNNYM),
Politechnika Slaska, Gliwice (Poland).
For primary bibliographic entry see Field 5D.
W77-06166

EFFECT OF A SECONDARY TREATED EFFLUENT ON THE MOVEMENT OF VIRUSES THROUGH A CYPRESS DOME SOIL,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
G. Bitton, N. Masterson, and G. E. Gilford.
Journal of Environmental Quality, Vol 5, No 4, p 370-375, October-December, 1976. 6 fig, 2 tab, 17 ref.

Descriptors: *Viruses, Movement, *Soil types, *Soil properties, *Sewage treatment, Sewage disposal, Sewage effluents, Adsorption, Polyelectrolytes, Waste water treatment, Path of pollutants, Bacteria.
Identifiers: Type 1 poliovirus, Bacteriophage T2, Bacterial phage MS2.

A study was performed to determine the movement of viruses through a sandy soil in a cypress dome. The study was designed to aid disposal of sewage effluents by land applications. Bacteriophage T2 was used as well as the animal virus, Sabin vaccine strain type 1 poliovirus. Results of column experiments indicated that the cypress dome soil had a potentially good retention capacity for the test viruses. A binding of the viruses to soil particles was promoted when tap water was used in the column experiments. The low pH of the soil also promoted viral adsorption, though adsorption was greatly decreased when the secondary effluent (dome water) was used. Organic substances in the water hindered adsorption. These interfering substances prevent viral adsorption to clays, microcline, membrane filters and polyelectrolytes, as well as magnetite. High molecular weight substances also reduced the interaction between bacterial phage MS2 and polyelectrolytes. Further experimentation was suggested to determine the reasons for virus breakthrough into wells 305 centimeters deep under the cypress dome. (Collins-FIRL)
W77-06173

CADMIUM DISTRIBUTION IN FOREST ECOSYSTEMS IRRIGATED WITH TREATED MUNICIPAL WASTE WATER AND SLUDGE,
Pennsylvania State Univ., University Park. Dept. of Forestry.
R. C. Sidle, and W. E. Sopper.
Journal of Environmental Quality, Vol 5, No 4, p 419-422, October-December, 1976. 6 tab, 12 ref.

Descriptors: *Soil contamination effects, Analysis, *Cadmium, *Toxicity, *Irrigation effects, *Return flow, Municipal wastes, Zinc, Forests, Ecosystems, Metals, Sewage effluent.
Identifiers: Cadmium/zinc ratio.

The introduction of heavy metals into natural biological systems relative to waste water applications on land was studied for 10 years by irrigating treated municipal waste water in an abandoned field area and in a mixed hardwood area (old gamelands). The major metal under study was cadmium. Concentrations in soil and plant samples were determined to evaluate accumulation and recycling of cadmium in forest ecosystems. Waste water, soil, and plant samples were analyzed for zinc to extrapolate cadmium/zinc ratios. Results indicated that cadmium (in the old field area) did not increase in spruce and wild strawberry and was lower in goldenrod in the effluent irrigated area than in the control area due to the greater biomass resulting from irrigation. Under conditions of low cadmium application in a waste water disposal system, cadmium concentrations in some herbaceous vegetation may decrease. No samples from the gamelands revealed increased cadmium levels from the waste water irrigation. Goldenrod had higher cadmium levels than white spruce or wild strawberry in the old field area. Red maple had higher cadmium levels than white oak or sarsaparilla in the old gamelands area. This indicated that a single species, rather than a composite of several species, should be sampled when determining the effect of waste water irrigation on the cadmium content of forest vegetation. Cadmium in soil was not significantly affected by the waste water irrigation in either area. However, there was an increase at the 0-5 centimeter depth in the old gamelands area. It decreased with depth in the soil profile in both treated and control areas. Cadmium/zinc ratios between the areas were not substantially different either. (Collins-FIRL)
W77-06178

MOLYBDENUM HAZARD IN LAND DISPOSAL OF SEWAGE SLUDGE,
State Univ. of New York at Binghamton. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5C.
W77-06180

EFFECTS OF ANNUAL AND ACCUMULATIVE APPLICATIONS OF SEWAGE SLUDGE ON ASSIMILATION OF ZINC AND CADMIUM BY CORN (ZEA MAYS L.),
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-06181

COAGULATION OF WATER WITH HIGH CONCENTRATION OF COLOR MATTER (OCZYSZCZANIE WODY O WYSOKIEJ BARWIE),
For primary bibliographic entry see Field 5G.
W77-06188

CONCERNING THE ARTICLE OF S. D. ZAUGOL'NIKOV, M. M. KOCHANOV, A. O. LIOT AND I. I. STAVCHANSKII, 'FORECASTING THE HAZARD OF ORGANIC COMPOUNDS IN THE ENVIRONMENT', (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W77-06195

A WATER QUALITY STUDY OF THE UPPER CLARK FORK RIVER AND SELECTED TRIBUTARIES,
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5A.
W77-06200

ASBESTOS IN WATER: MINING AND PROCESSING EFFLUENT TREATMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5D.
W77-06218

FERTILITY AND MIXED SALINITY ON GROWTH AND CA, MG, NA, P AND CI CONCENTRATIONS OF TOMATO, CORN, AND SUDAN GRASS GROWN IN SAND CULTURE,
California Univ., Los Angeles. Plant Nutrition.
For primary bibliographic entry see Field 3C.
W77-06233

INORGANIC POLLUTION FROM FORESTS AND RANGELANDS,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
H. A. Froehlich.
In: Non-point Sources of Water Pollution, Seminar conducted at Oregon State University, Water Resources Research Institute, Spring Quarter, 1976, p. 9-15. 3 fig, 8 ref.

Descriptors: *Water pollution, *Water pollution sources, *Water pollution control, Water quality, Sediment load, Sediment discharge, Forest watersheds, Streams, Sediment yield, Watershed management, Range management.
Identifiers: *Inorganic pollutants.

A problem exists in setting up water quality standards for inorganic pollution from forest and rangelands because of the degree of variation of sediment load and in sampling techniques which exists for collecting data from most streams. This large variation makes enforcement of strict standards, similar to the type used for point sources of pollution, nearly impossible. High sediment loads exist in streams that are located in arid areas with low precipitation and high storm intensities. In forested areas of Arizona sediment yields in streams commonly reach 200-300 tons per square mile per year. Monitoring and controlling practices which produce excessive inorganic pollution (logging, roadbuilding, silvaculture and grazing) rather than setting direct water quality standards. An example of successful results is cited in Oregon where implementation of the Oregon Forest Practices Act achieved high water quality standards. (Bennett-Arizona)
W77-06239

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-06264

THE DISTRIBUTION OF PB, ZN, CD, AND CU WITHIN THE PULMONATE MOLLUSC HELIX ASPERSA MULLER,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-06265

PRESENCE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) IN ARCTIC AND SUBARCTIC MARINE FOOD CHAINS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemicals Section.
G. W. Bowes, and C. J. Jonkel.
Journal of the Fisheries Research Board of Canada, vol. 32, p. 2111-2123, 1975. 4 fig., 3 tab., 29 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, Industrial wastes, *Food chains, Mammals, *Food webs, *Arctic, Cold regions, Animal physiology, Bioassay, Wildlife, Ecosystems, *Carnivores, Laboratory tests, Pollutants, *Path of pollutants, Pesticide residues, Populations, *Trout, Distribution.
Identifiers: Bioaccumulation, Tissue analysis, Seals, Polar bears, Arctic char, Ursus maritimus, Phoca hispida, Erignathus barbatus, Salvelinus alpinus, Subarctic.

Polychlorinated biphenyls (PCB), man-made industrial chemicals, were identified in tissues of polar bears (Ursus maritimus), ringed (Phoce hispida) and square flipper (Erignathus barbatus) seals, and Arctic char (Salvelinus alpinus) of the Canadian arctic and subarctic. PCB content in tissue increased from seals to adult polar bears to polar bear cubs and young. Polar bear milk contained high concentrations of PCB and was the most probable source of the high concentrations in polar bear cubs. Chromatograms revealed a greater accumulation of higher chlorinated PCB isomers in polar ears than in seals, their main food. Residue data suggested that polar bear subpopulations in the eastern Canadian arctic and subarctic had been exposed to higher levels of PCB and DDT than western subpopulations. (Katz)
W77-06266

DIRECT AND INDIRECT EFFECTS OF OIL ON RINGED SEALS (PHOCA HISPIDA) OF THE BEAUFORT SEA,
Ontario Veterinary Coll., Guelph.
For primary bibliographic entry see Field 5C.
W77-06267

YEASTS FROM BRACKISH WATERS IN LORRAINE, (IN FRENCH),
Nancy-1 Univ. (France). Unite de d'Enseignement et de Recherche des Sciences Pharmaceutiques.
F. Hinzelin, and P. Lectard.
Hydrobiologia 49(1), p 27-32, 1976.

Descriptors: *Yeasts, *Brackish water, Chlorides, Saline water.
Identifiers: *France(Lorraine), *Sporobolomyces.

Yeasts populations of saline water in Lorraine (France) were studied in relation to the quantity of chloride contained in these waters. The yeasts isolated were not strictly halophitic species. The pink yeasts are the most frequent, especially Sporobolomyces.–Copyright 1976, Biological Abstracts, Inc.
W77-06269

COMMUNITY AND SPECIES RESPONSES OF CHIRONOMIDAE (DIPTERA) TO CONTAMINATION OF FRESH WATERS BY CRUDE OIL AND PETROLEUM PRODUCTS WITH SPECIAL REFERENCE TO THE TRAIL RIVER, NORTHWEST TERRITORIES,
Fisheries and Marine Service, Winnipeg (Manitoba).
For primary bibliographic entry see Field 5C.
W77-06270

THE ERYTHROCYTE TRANSPORT AND TRANSFER OF METHYLMERCURY TO THE TISSUES OF THE RAINBOW TROUT (SALMO GAIRDNERI),
State Univ. of New York at Buffalo. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W77-06273

EXPERIMENTAL STUDY OF THE NITROGEN EXCRETION OF BASS (DICENTRARCHUS LABRAX) DURING GROWTH. II. EFFECTS OF STARVATION ON THE EXCRETION OF AMMONIA AND UREA, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 5C.
W77-06279

LONDON'S STORMWATER PROBLEM,
Greater London Council (England).
R. W. Horner, L. B. Wood, and L. R. Wroe.
Journal of the Water Pollution Control Federation, Vol. 49, No. 1, p 103-110, January 1977. 1 fig, 2 tab, 3 ref.

Descriptors: *Storm water, *England, *Drainage systems, *Urban runoff, *Water pollution sources, *Water pollution control, Storm drains, Sewers, Storm runoff, Urban drainage, Surface runoff, Stormflow, Streams, Runoff, Rivers, Water quality, Model studies.
Identifiers: *River Thames(England), *London area(England).

Considerable quantities of storm water are discharged to the River Thames and its tributaries by surface water sewers and also from storm overflows on foul sewers. In the past, when the quality of water in the River Thames was poor, few problems were caused by these discharges. The considerable improvement in water quality in the River Thames and the great increase of the fish population, which have been achieved in recent years as a result of major improvements to the main wastewater treatment works discharging effluent to the river, result in a condition where heavy storm water discharges, particularly those from the central area, could reduce oxygen level in the river considerably and also could lead to widespread fish kills. Storm water discharges from the main pumping stations have been monitored for the past 8 years, and plans are being prepared for the construction of new trunk sewers. The new trunk sewers will provide storage to receive the most polluted early discharges of storm water. The new sewers will provide the capacity to transport about 1,800 l (400 gal) per head per day. (Henley-ISWS)
W77-06297

SIMPLIFIED ANALYSIS OF SURFACE BUOYANT JET,
Ontario Hydro, Toronto.
A. Natalizio, and W. D. Baines.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY2, Proceedings Paper 12737, p 123-132, February 1977. 5 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Jets, *Buoyancy, *Surface waters, *Mixing, Flow, Fluid mechanics, Thermal pollution, Heated water, Analytical techniques, Theoretical analysis, Laboratory tests, Evaluation, Profiles, Entrainment, Movement.
Identifiers: Dilution rate.

Flow in a jet of warm water ejected normal to a uniform stream at the surface was analyzed, using the equations of conservation of mass, momentum, and thermal energy. A simple solution was obtained by using the observed fact that the dilution rate is constant. The resulting jet trajectory agreed closely with experimental results. Two empirical parameters were required. One parameter is a shape factor that depends on the width/depth ratio of the source, and the other is an entrainment factor that is a function of the source Richardson number. In the far field where the jet is bent over and moving with the velocity of the cross-flow, experimental data are lacking, and dilution rates cannot be predicted. However, dimensional requirements alone are sufficient to determine the shape of the center line. It was evident from this analysis, particularly from the small amount of data

available, that more experimental studies are required. (HumphreyshISWS)
W77-06298

DISTRIBUTION OF WIND-DRIVEN CURRENTS IN BODIES OF WATER AND ESTIMATION OF THE TRANSPORT OF WATER BY THEM,
For primary bibliographic entry see Field 2H.
W77-06306

NATURAL CONTAMINATION OF THE FIRN-ICE LAYER OF THE ABRAMOV GLACIER, ACCORDING TO CORE DRILLING,
For primary bibliographic entry see Field 2C.
W77-06308

WATER QUALITY VARIATIONS FOR PUMPING WELLS,
Ground-Water Quality Consultant, Fresno, Calif.
K. D. Schmidt.
Ground Water, Vol 15, No 2, p 130-137, March-April 1977. 7 fig, 9 ref.

Descriptors: *Groundwater, *Water quality, *Monitoring, *California, *Water wells, Water pollution, Nitrates, Shallow wells, Alluvial aquifers, Fluctuations, Variability, Sampling, Water sampling, Seasonal, Water supply, Pumping.
Identifiers: *San Joaquin Valley(Calif), *Fresno(Calif).

Past groundwater quality monitoring programs have often involved sampling of low-capacity wells near point or line sources of recharge or pollution. However, large-capacity wells produce much of the groundwater pumped for municipal, industrial, and agricultural uses. Short-term, seasonal, and long-term fluctuations in quality are common for water pumped from many large-capacity wells. In many cases, there is a considerable difference between in-situ 'groundwater quality' and the quality of water sampled at the well discharge. Short-term pump tests for several municipal wells in the San Joaquin Valley, California, indicated that nitrate concentrations decreased exponentially with pumping time. Variability in pump operation creates substantial short-term changes in well water quality. Short-term changes are most evident for infrequently pumped, shallow wells near point or line sources of recharge or pollution. Seasonal changes in quality have been documented for water from wells in areas of diffuse sources of pollution, such as agricultural return flow and septic tanks. These changes are due primarily to significant changes in depth to water and vertical hydraulic head gradient. Once the short-term and seasonal trends are established, the optimal sampling approach can be determined in order to establish long-term trends. (Humphreys-ISWS)
W77-06310

AN INTEGRATED APPROACH TO DELINEATING CONTAMINATED GROUND WATER,
Berk and Ciaramella, Cranbury, N.J.
W. J. Berk, and B. S. Yare.
Ground Water, Vol 15, No 2, p 138-145, March-April 1977. 5 fig, 3 tab, 6 ref.

Descriptors: *Groundwater, *Water pollution sources, *Atlantic Coastal Plain, *Groundwater movement, Observation wells, Groundwater recharge, Water pollution, Hydrogeology, Sodium chloride, Aquifers, Hydrology.
Identifiers: *Groundwater quality, Groundwater contamination, Resistivity survey, Sodium hydroxide.

Disposal of industrial process water into an unlined lagoon in permeable Atlantic Coastal Plain sediments resulted in a groundwater contamination problem caused by infiltration of the process water into a major unconfined aquifer which underlies the lagoon at shallow depth. Most of the area water supply wells terminate in this formation. Before this disposal method was discontinued, traces of the process water appeared in nearby wells. Because of the relatively large area and depths involved, as indicated by preliminary data, delineation of the distribution of contaminant within the aquifer through a systematic well drilling program posed a significant economic problem. To keep costs within a reasonable range, a resistivity survey program was implemented to obtain information on the gross distribution of the contaminant and to provide data for the selective location of monitor wells. Eight wells were constructed to obtain samples of the groundwater in order to measure contaminant concentrations and to verify the interpretations of areal contaminant distribution inferred from the resistivity data. The groundwater sampling procedure developed during this investigation was described. The combination of the resistivity survey with the groundwater sampling procedure developed during this investigation proved to be a valuable and reliable technique for delineating in three dimensions a contaminant body within an aquifer in unconsolidated sediments. Utilization of the resistivity survey data to selectively locate the monitor wells and to define the lateral extent of the contamination increased the efficiency of the investigation and significantly reduced the cost of the program. (Lee-ISWS)
W77-06311

GROUND-WATER TURBIDITY RESULTING FROM ARTIFICIAL RECHARGE,
Agricultural Research Service, Fresno, Calif. Water Management Research; and Agricultural Research Service, Fresno, Calif. Western Region.
H. I. Nightingale, and W. C. Bianchi.
Ground Water, Vol 15, No 2, p 146-152, March-April 1977. 8 fig, 1 tab, 21 ref.

Descriptors: *Groundwater, *Turbidity, *California, Groundwater recharge, Artificial recharge, Salinity, Wells, Groundwater movement, Hydrology, Aquifers, Aquifer testing, Laboratory tests, On-site investigations.
Identifiers: *Groundwater quality, *Groundwater turbidity, Soil pore space.

Turbid groundwater is rarely observed in domestic or public supply aquifers. At the Leaky Acres Recharge Facility at Fresno, California, water of low salinity (less than 50 micromhos/cm) and turbidity (less than 5 FTU, Formazin turbidity units) is recharged in the spreading basins. Six months after the start of the third (1973) recharge period, the groundwater salinity was decreased to about 100 micromhos/cm from the initial mean of 147 micromhos/cm, and the groundwater became visibly turbid (more than 5 FTU). Two months later, some peripheral domestic wells also began to become turbid. After two more recharge periods (1974 and 1975), turbidity at 10 observation wells beneath Leaky Acres averaged 18 FTU, and salinity averaged 74 micromhos/cm. By this time, groundwater turbidity in peripheral wells near Leaky Acres had decreased to less than 0.5 FTU. This turbidity was raced to poorly crystallized and extremely fine colloids, which have leached from the surface soils because of the low salinity of the recharge water. Laboratory and field studies showed that gypsum application will reverse the phenomena, but such treatment is uneconomical. This phenomenon is a transient one, and now turbidity outside the recharge area is insignificant from a water quality viewpoint. However, the magnitude of the mass of material in transit through the profile if stabilized through flocculation or sieving in soil pore space, could greatly change the water transmission and so recharge project performance. However, this effect has not yet been noted at Leaky Acres. (Lee-ISWS)
W77-06312

NITRATE AND CHLORIDE IN GROUND WATER UNDER IRRIGATED AGRICULTURE IN CENTRAL WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soil Science.
P. G. Saffigna, and D. R. Keeney.
Ground Water, Vol 15, No 2, p 170-177, March-April 1977. 3 fig, 4 tab, 18 ref.

Descriptors: *Nitrates, *Chlorides, *Groundwater, *Wisconsin, Agriculture, Irrigation, Return flow, Leachate, Fertilization, Potatoes, Beans, On-site data collections, Groundwater movement, Sampling, Water quality, Land management.
Identifiers: *Sand plains, PL92-500, Non-point discharge, Transit time.

Results of this study indicated that the nitrate and chloride concentrations in the groundwater of the central Wisconsin sand plains are significantly above background, and that the main source is the irrigated agriculture in the region. The study was conducted at three levels of intensity: a small field during one growing season, a University Experimental Farm over several years, and many local farms during part of a growing season. Differences in concentrations of nitrate-N and chloride in the surface of the groundwater underlying the moderately fertilized potato field closely reflected the fertilizer and irrigation management on different parts of the field during that season. This detailed study of one field showed that solute transit times through the 16 ft (5 m) of unsaturated zone to the surface of the groundwater are less than a year. Differences in concentration of nitrate-N and chloride between irrigation wells on the Experimental Farm closely reflected the irrigation and fertilizer practices on surrounding fields. On a large scale, the nitrate-N and chloride concentrations in area farmer irrigation wells were as different between wells on the same farm as among the various farms. (Visocky-ISWS)
W77-06313

PROS AND CONS OF STORM WATER RECHARGE WELLS,
Virginia State Water Control Board, Richmond.
N. K. Breeding, Jr., and J. W Dawson.
Water and Sewage Works, Vol. 124, No. 2, p 82-84, February 1977. 2 fig, 1 tab, 7 ref.

Descriptors: *Groundwater recharge, *Recharge wells, *Virginia, *Storm runoff, Groundwater movement, Water quality, Water chemistry, Storm drains, Storm water, Subsurface drainage, Urbanization, Cities, Urban drainage, Water pollution, Pollutants, Path of pollutants, Geology, Faults(Geologic), Hydrogeology.
Identifiers: *Roanoke(VA).

While drainage wells have provided a cost effective means of disposal of storm water runoff for Roanoke, Virginia, some annual maintenance is required, and ponding problems are still present in some areas. Roanoke, Virginia, uses approximately 120 drainage wells for the disposal of storm water runoff. Subsurface disposal of storm water proved to be a very economical alternative at the time since construction of the wells costs approximately $85,000 compared to about $5 million for conventional storm sewers. However, the wells periodically need cleaning, and some wells have had to be abandoned due to siltation in the vicinity of the well. Available storm drainage well data indicates that these wells have th potential of supplying significant recharge to this Cambrian-Ordovician Aquifer System, if precipitation conditions permit. The potential for contamination of the aquifer system is significant, and current analyses indicate that groundwater quality degradation has ocurred locally in the study area. A major concern is the long-range impact of these disposal wells on the overall quality of the water in this aquifer system. Groundwater movement in karst terrain typically is erratic; however, solution channels can act as a series of pipes and conduits that will permit rapid and widespread movement

of contaminants. To data, groundwater users in adjacent Roanode County have not experienced quality problems that could be connected to this means of storm water disposal. (Sims-ISWS)
W77-06324

EVALUATION OF ARSENIC CONCENTRATIONS IN THE TULPEHOCKEN CREEK BASIN,
Geological Survey, Harrisburg, Pa. Water Resources Div.
C. R. Wood.
Open-file report, 1973. 16 p, 6 fig, 4 tab, 4 ref.

Descriptors: *Arsenic compounds, *Waste disposal, *Lagoons, *Path of pollutants, *Pennsylvania, Soils, Groundwater, Streams, Industrial wastes, Water pollution sources, Monitoring, Data collections.
Identifiers: Tulpehocken Creek basin(Pa), Arsenic.

Prior to 1964, industrial wastes containing more than one million pounds (450,000 kilograms) of arsenic were placed in lagoons overlying a carbonate aquifer near Myerstown, Pa. Although 450,000 pounds (200,000 kilograms) of arsenic were removed from the ground water near the disposal site, at least 50,000 pounds (23,000 kilograms) of soluble arsenic compounds are still present. In addition, soil samples collected in 1973 indicate that the bulk of the arsenic present in the soil in 1965 was not removed during the recovery operation. Arsenic concentrations in the ground water and in Tulpehocken Creek have continued to decline since recovery operations stopped in 1971. Arsenic concentration in the streamflow reaching the proposed Blue Marsh Lake will probably exceed 50 micrograms per liter only a few days a year. (Woodard-USGS)
W77-06330

LEACHATE PLUMES IN A HIGHLY PERMEABLE AQUIFER,
Geological Survey, Mineola, N.Y.
G. E. Kimmel, and O. C. Braids.
Ground Water, Vol 12, No 6, November-December 1974. 5 p, 6 fig, 6 ref.

Descriptors: *Landfills, *Leachate, *Path of pollutants, Groundwater, Waste disposal, Solid wastes, Water table aquifers, Water pollution sources, Water analysis, Chemical analysis, Evaluation, Water pollution control, *New York.
Identifiers: *Long Island(NY), Upper glacial aquifer.

Two landfills, 27 and 41 years old, were studied and found to have plumes of leachate-contaminated ground water extending 10,600 and 5,000 ft respectively, from the site of deposition in the upper glacial aquifer on Long Island, New York. The plumes sink to the bottom of the aquifer, which is 70 ft below the water table at the 27-year old site and 170 ft below at the 41-year old site. The aquifer has a hydraulic conductivity of 270 ft per day. Amounts of Na, HCO3, and C1 and occasionally amounts of Cam are greater in plume water than in ambinet ground water. Percentage of SO4 increases away from the landfills. Nitrogen in plume water is mainly in the form of NH4. The pH of plume water decreases from about 7 near the landfill to a native water value of about 5 along the perimeter of the plume. Heavy metals other than iron, manganese, and zinc were not found in concentrations greater than several tens of micrograms per liter away from the landfill. Selenium concentration in plume water is occasionally greater than 10 micrograms per liter. The extent of ground-water contamination caused by landfills suggests that size and growth rate of a landfill are more significant than age. Depending on geologic conditions, ground-water contamination near a landfill might be avoided on Long Island by lining the pit and collecting the leachate. (Woodard-USGS)
W77-06331

PESTICIDES DATA-COLLECTION ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN TEXAS,
Geological Survey, Lakewood, Colo. Water Resources Div.
D. B. Manigold.
Open-file report 74-51, May 1974. 10 p, 18 ref.

Descriptors: *Pesticides, *Texas, *Streams, *Groundwater, *Sediments, Estuaries, Reviews, Data collections, Sampling, Sites, Water analysis.

In 1965, the U.S. Geological Survey initiated a monthly monitoring program on 3 streams in Texas, screening for 9 of the more commonly used organochlorine insecticides: Aldrin, DDD, DDE, DDT, dieldrin, endrin, heptachlor, heptachlor epoxide, and lindane. Later, the herbicides 2,4-D; 2,4,5-T; and silvex were added. In 1967 a quarterly monitoring program was initiated at 26 sites on the principal streams of the State and a survey of the occurrence of pesticide residues in ground water. By 1970, the Geological Survey had developed methods for measuring pesticide residues in sediment, and in that year, the quarterly analysis of stream-bottom materials at 39 sites was added to the data collection program. Geological Survey pesticide data for 108 sites on nontidal reaches of streams in Texas have been summarized by Rawson (1974). The pesticides studied are widely distributed in surface waters in Texas. The most widely distributed chlorinated-hydrocarbon insecticides were dieldrin at 77 sites, DDT at 67 sites, lindane at 59 sites, and chlordane at 38 sites. The most widely distributed phosphorothioate insecticide was diazinon, which was detected at 80 sites. Small amounts of each of the chlorinated-hydrocarbon herbicides were widely distributed (2,4,5-T at 96 sites, 2,4-D at 78 sites, and Silvex at 47 sites). Although only chlordane, in 2 samples from 1 site exceeded the maximum limit recommended for water to be used for public supply, 1 or more pesticides in at least 1 sample from 57 sites exceeded the maximum environmental level for marine waters recommended by the National Technical Advisory Committee. (Woodard-USGS)
W77-06344

WATER SUPPLY AND WASTE DISPOSAL, CULEBRA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico.
For primary bibliographic entry see Field 5E.
W77-06345

HISTORY OF DREDGING AND FILLING OF LAGOONS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
S. R. Ellis.
Water-Resources Investigations 38-76 (open-file report), September 1976. 25 p, 19 fig, 10 ref.

Descriptors: *Lagoons, *Bathymetry, *Dredging, *Water quality, *Puerto Rico, Canals, Mapping, Aerial photography, Depth, Surveys, Water transfer, Water properties, Evaluation.
Identifiers: Laguna La Torrecillo, Laguna de Pinones, Laguna San Jose, Laguna del Condado.

Laguna La Torrecilla, Laguna de Pinones, Laguna San Jose, and Laguna del Condado, in the San Juan, Puerto Rico area, are located within a metropolitan area of more than 1 million people. Bathymetric maps made during the study, in 1973, showed that Lagunas La Torrecilla, San Jose, and del Condado have been modified by dredging and filling; whereas, Laguna de Pinones has remained in a near natural state. Laguna La Torrecilla has been dredged to a depth, in places, of about 18 meters, and Lagunas San Jose and del Condado, in places to about 11 meters. Dredging in the San Juan lagoons has been harmful, beneficial, and in a few instances has had little or no noticeable effect on the water quality. Usually, dredging in the connecting canals has been beneficial if the water entering the lagoons through the canals was of better quality than the water in the lagoon. Dredging in the mouths of lagoons has been beneficial; whereas, filling or blocking the mouths has been harmful. (Woodard-USGS)
W77-06346

WATER IN A LIMESTONE TERRANE IN THE BOWLING GREEN AREA, WARREN COUNTY, KENTUCKY,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-06347

MERCURY LEVELS IN THE RIVERS OF WESTERN CANADA 1970-1976.
Dept. of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W77-06363

BLACK AND WHITE EPISODES,
Swedish Water and Air Pollution Research Lab., Gothenburg.
For primary bibliographic entry see Field 5A.
W77-06364

PCB INVESTIGATIONS OF THE MISSISSIPPI RIVER AND ITS TRIBUTARIES WATER, BOTTOM SEDIMENT AND POINT SOURCES,
Minnesota Pollution Control Agency, Minneapolis. Surface and Groundwaters Section.
For primary bibliographic entry see Field 5C.
W77-06368

PRELIMINARY REPORT ON THE POLYCHLORINATED BIPHENYLS IN THE MISSISSIPPI RIVER AND LAKE PEPIN.
Minnesota Pollution Control Agency, Minneapolis. Water Quality Div.
For primary bibliographic entry see Field 5A.
W77-06370

EFFECTS OF LEACHED MIREX ON EXPERIMENTAL COMMUNITIES OF ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, Fla.
For primary bibliographic entry see Field 5C.
W77-06376

HYDROGEOLOGY OF THE SPRING WATERS WITH HIGH F CONTENT FROM THE SURROUNDINGS OF TENDUREK VOLCANO, (IN TURKISH),
Ataturk Univ., Erzurum (Turkey).
Nazmi Oruc, Nazmi Alpman, and I. Hakki Karamanderesi.
Turk Joel Kurumu Bul 19(1), p 1-8, 1976.

Descriptors: *Hydrogeology, *Fluoride, *Springs, *Fluorine, Potable water, Water supply, Lava, Sampling, Irrigation, Volcanoes, Human diseases.
Identifiers: *Tendurek volcano region(Turkey).

Water samples from some springs used for drinking and irrigation were collected in the Tendurek volcano region of E Turkey. Most of the spring water sampls contain very high amounts of F ranging from 2.5-12.5 ppm. The incisors and molars of a 2 yr old sheep with fluorosis exhibited brown to black staining and excessive and irregular wear. Dental fluorosis was observed in the local population. Dilution of F rich water with other suitable water to a safe level was recommended to alleviate effects of F on livestock and human health and on soil and pasture contamination. Around the Tendurek mountain are metamorphic rocks composed of micaschists, marble and quartzites, probably Paleozoic in age; crystalline limestones, Permo-Carboniferous in age; Upper Cretaceous

ophiolotes containing spilites, serpentinites and limestones; Paleocene limestones; Eocene flysch and limestone; sandstone, claystone, siltstone and limestones of Miocene age; and Tertiary lava flows. The whole succession is covered by young basaltic lava flows from Tendurek volcano. Spring water comes from these lavas, flysch and ophiolite limestones, and basement marbles. Ten samples were analyzed from these springs. High F waters are NaHC03 type, and low F waters are Ca-MgHCO3 type. F, possibly transported by fumaroles or escaped from devitrified lavas, could be held on the surface of some minerals and then exchanged with OH of ground water with high pH. At the end of this hypothetical process these waters may be discharged as high F water at the foothills of Tendurek volcano.--Copyright 1976, Biological Abstracts, Inc.
W77-06379

HYDROBIOLOGICAL SITUATION OF THE GULF OF FOS IN 1969, (IN FRENCH),
Aix-Marseille-2 Univ. (France). Laboratoire d'Hydrobiologie.
F. Blanc, M. Leveau, and M.-C. Bonin.
Rev. Int Oceanongr Med 41/42, p 41/75, 1976.

Descriptors: *Hydrobiology, Effluents, Industrial wastes, Phytoplankton, Zooplankton, Eutrophication, Distribution.
Identifiers: Acartidae, Chaetoceros-curvisetus, Evadne, Exuviella, France, Melosira, Paracalanus, Podon-polyphemoides, Prorocentrum, Situation, Skeletonema-costatum, *Gulf of Fos(France).

During 1969 2 cruises were made in the gulf of Fos (France), during the spring and autumn phytoplanktonic blooms, respectively. A third was made in summer during a paucity of phytoplankton. The ecological parameters studied show that freshening and eutrophication are important in this area; the latter may be explained by the input of many natural and industrial effluents carrying nutrients. In spring the whole gulf exhibits an intensive growth of Skeletonema costatum of about 70 millions of cells/1. Data from all seasons were submitted to a mathematical analysis. Three influence are predominant: Rhone influence (water of reduced salinity and higher content in nutrients, phytoplankton from both marine (Chaetoceros curvisetus) and freshwater origin (Melosira , Scenedesmiales) parenthesis; neritic influence (more marine, poor in nutrients, marine fauna and flora more diversified than in the 1st type); northern freshwater influence (nearly freshwater, polluted, rich in phosphates, bloom of dinoflagellates (Prorocentrum and Exuviella) and predominance of Acartidae). In the northern area important nutrients concentrations induce intensive development of some planktonic species, mainly dinoflagellates. These release toxins which induce zooplankton (Evadne, Paracalanus) to retreat southwards. Distribution of the very tolerant Acartidae and Podon polyphemoides is linked to the dinoflaggelates.--Copyright 1976, Biological Abstracts, Inc.
W77-06380

THE GEOTHERMAL PLANT AT AHUACHAPAN IN EL SALVADOR AND ITS POSSIBLE EFFECTS ON THE WATER QUALITY ON THE BORDER RIVER RIO PAZ BETWEEN EL SALVADOR AND GUATEMALA,
Swedish Water and Air Pollution Research Lab., Goteborg.
A. Jernelov, H. Hultberg, and I. Rosenblum.
IVL Report B 297, June 1976. 17 p. 7 fig, 1 tab.

Descriptors: *International commissions, *Thermal springs, *Powerplants, *Waste water disposal, Injection, *South America, Boron, Arsenic compounds, Steam, Rivers, Saline water, Groundwater, Recharge, International waters, United Nations, Foreign countries, Sodium arsenite, Geothermal studies.
Identifiers: *Geothermal powerplants, Ahuachapan(El Salvador), *Rio Paz(El Salvador), Guatemala, Powerplant effluents, Hot water wells, River Aqua Caliente(El Salvador).

A United Nations Development Program (UNDP) committee weighed the problem of pollution from arsenic, boron and other effluent-borne elements generated by a geothermal power plant and affecting a border river in Central America. Steam from drilled wells at Ahuachapan, El Salvador, with high temperature and pressure, is naturally produced from a subsurface saline hot water reservoir and is used to generate power. Process water was disposed via a channel from the plant to the Rio Paz, bordering Guatemala and El Salvador. The subterranean water is about 8% saline and contains about 7.4% arsenic and 7.1% boron which far exceeds limits imposed by the World Health Organization. The Rio Paz naturally contains high levels of arsenic and boron, especially during the dry season, and further input of these elements would imperil its use as a supply for drinking water, agricultural use, and the coastal fishery in the Pacific Ocean. The UNDP committee recommended that the process water be reinjected into the underground thermal reservoir to eliminate pollution of the Rio Paz and to maintain the groundwater at levels to allow expanded power production. The channel from the plant to the river was to be closed. (Auen-Wisconsin)
W77-06382

ATTENUATION OF POLLUTANTS IN MUNICIPAL LANDFILL LEACHATE BY CLAY MINERALS: PART 1-COLUMN LEACHING AND FIELD VERIFICATION,
Illinois State Geological Survey, Urbana.
R. A. Griffin, K. Cartwright, N. F. Shimp, J. D. Steele, and R. R. Ruch.
Illinois Environmental Geology Notes 78, November 1976. 34 p. 12 fig., 8 tab., 27 ref.

Descriptors: *Water pollution control, *Landfills, *Leaching, *Attenuation, *Linings, Clays, *Illinois, Design, Sites, Waste dilution, Hydraulic conductivity, Design criteria.
Identifiers: Landfill design.

This study indicates that the use of hydraulic conductivity information and the pollution hazard rating for a given landfill leachate are the preferred determinants for landfill design as opposed to the prevalent 'containment' design. Laboratory tests with leachate passed through columns that contained mixtures of calcium-saturated clays and washed quartz sand in various percentages measured the dilution of 16 chemical constituents and their vertical distribution. Chloride, sodium, and water-soluble organic compounds (COD) were relatively undiluted by passage through the clay columns; potassium, ammonium, magnesium, silicon, and iron were moderately diluted; and lead, cadmium, mercury and zinc were strongly diluted by even small amounts of clay. Concentrations of calcium, boron, and manganese were markedly higher in the effluents than in the original leachate. Montmorillonite had the highest dilution capability, followed by illite and then kaolinite. The principal attenuation mechanism for lead, cadmium, mercury, and zinc was by precipitation. The results suggest that pollution from landfill leachate would be reduced if landfill liners of earth materials were designed for higher hydraulic conductivity and selective attenuation of toxic pollutants, and allowing the ground water to dilute the nontoxic leachate components to acceptable levels. The current geologically and environmentally unacceptable sites can thus be physically modified by correct design to eliminate costly long distance transportation of wastes from metropolitan areas. (Auen-Wisconsin)
W77-06395

PROCEEDINGS OF THE CONFERENCE ON NONPOINT SOURCES OF WATER POLLUTION: PROBLEMS, POLICIES AND PROSPECTS.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 665, Price codes: A08 in paper copy, A01 in microfiche. Held at Purdue University, September 13-14, 1976. 159 p, 34 fig, 6 tab, 185 ref. Harry R. Potter, editor. OWRT A-999-IND(5).

Descriptors: *Water pollution, *Farm wastes, *Water pollution sources, *Nutrients, *Sediment discharge, *Urban runoff, Mine acids, Path of pollutants, Strip mine wastes, Forests, Agricultural, Highways, Precipitation(Atmospheric), *Conferences, *Indiana.
Identifiers: *Nonpoint pollutants.

The objective of this conference was to identify the nature, sources, and extent of nonpoint pollution, and to describe what is known about its effect and what is being done. This included identifying problems in programs and policies, as well as gaps in knowledge, particularly as applied to Indiana. There were 13 papers presented in the areas of precipitation, urban runoff, highways, agriculture, forests, and mining. Also included was an overview of policies and programs, and a panel discussion on problems, prospects, and practicalities.
W77-06396

DISTRIBUTION AND ISOLATION OF RADIOACTIVITY FROM 74AS-ARSENATE AND 14C-METHANEARSONIC ACID IN AN AQUATIC MODEL ECOSYSTEM,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5C.
W77-06408

ENVIRONMENTAL STUDY OF THE DISPOSAL OF RED MUD WASTE,
Department of the Northern Territory, Darwin (Australia). Animal Industry and Agriculture Branch.
For primary bibliographic entry see Field 5E.
W77-06427

NONPOINT SOURCES AND PLANNING FOR WATER POLLUTION CONTROL,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
W. Whipple, Jr., and J. V. Hunter.
Journal of the Water Pollution Control Federation, Vol 49, No 1, p 15-23, January 1977. 6 fig, 3 tab, 23 ref. OWRT C-5341(4239)(6).

Descriptors: *Water pollution control, *Urban runoff, *Heavy metals, *Water pollution, *Biochemical oxygen demand, Water properties, Water quality, Water pollution sources, Storm runoff, Rainfall, Runoff, Urban drainage, Planning, Pollutants, Pollution abatement, Storm water, Phosphates, Nutrients.
Identifiers: *Nonpoint water pollution, *Urban storm runoff, Coliform count, Illegal dumping.

A review of studies concerning water pollution control was made, and the following conclusions were presented: Nonpoint sources and urban runoff must be considered in the planning of water pollution control, but data are lacking and necessary technology is deficient. Shock loads of organic material from urban storm runoff can depress dissolved oxygen levels in receiving waters. Urban runoff is also high in sediment, phosphates, coliform count, and heavy metals. Frequent samplings throughout the storm are required to estimate pollution loadings. Methods are required to derive biochemical oxygen demand loadings during design storms; and also, methods are required to derive annual or seasonal averages, based upon discharge or rainfall frequencies. Some irregularities in pollutant occurrence are

caused by illegal dumping. Heavy metals in storm runoff largely occur as particulate matter. This polluted sediment may settle into the bed of streams where it is taken up by benthal macroinvertibrates. Control of urban runoff pollution is apt to be very expensive. Planning approaches must be flexible and not rely on any single, arbitrary standard. (Henley-ISWS)
W77-06461

TRANSPORT PATHWAYS OF POLYCHLORINATED BIPHENYLS IN ATLANTIC WATER,
Woods Hole Oceanographic Institution, Mass.
G. R. Harvey, and W. G. Steinhauer.
Journal of Marine Research, Vol. 34, No. 4, p. 561-575, 1976. 4 fig., 3 tab., 32 ref.

Descriptors: *Polychlorinated biphenyls, *Path of pollutants, *Atlantic Ocean, *Water pollution sources, Water quality, Surface waters, Sea water, On-site investigation, Gas chromatography, Pollutant identification.
Identifiers: *Transport pathways, Precipitation patterns, Atmospheric transportation processes.

The distribution of polychlorinated biphenyls (PCB) in the surface waters of the Atlantic showed concentration maxima in latitudes of high net precipitation and a minimum in the mid-latitudes. Very low PCB concentrations were found in the south Atlantic. Since the nonvolatile inorganic radionuclide distribution in the Atlantic showed no dependence on precipitation patterns, codistillation with evaporating water was determined to be a major factor in determining the distribution of PCBs. Arguments were presented for the net northward migration of PCBs in surface waters with eventual entrainment in the southward North Atlantic Deep Water. (Katz)
W77-06469

DEGRADATION OF PHENOLIC COMPOUNDS DOWNSTREAM FROM A PETROLEUM REFINERY COMPLEX,
Institut National de la Recherche Scientifique, Rimouski (Quebec).
G. Polisois, A. Tessier, P. G. C. Campbell, and J. P. Villeneuve.

Descriptors: *Water pollution sources, *Oil industry, *Oil pollution, *Oil wastes, *Phenols, *Chemical wastes, *Biodegradation, Chemical reactions, Laboratory tests, Temperature, Environmental effects, Chemical degradation, Analytical techniques, *Path of pollutants, Pollutant identification.
Identifiers: *Oil refineries.

Measurements downstream from refinery outfalls in the region of Montreal East showed that, under favorable temperature conditions, the concentration of phenolic substances in the riverwater rapidly diminished with distance from the refineries. Mass balance calculations at different transverse sections showed that the decrease in concentration could not be attributed to dilution only. Laboratory experiments on river water samples demonstrated the effects of water temperature and sterilization on the ratio of phenol breakdown. Results supported the idea that biodegradation was responsible for the self-purification of phenolics in the St. Lawrence River. (Katz)
W77-06470

THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCUS VESICULOSUS IN THE BRISTOL CHANNEL,
Institute for Marine Environmental Research, Plymouth (England).
A. W. Morris, and A. J. Bale.
Estuarine and Coastal Marine Science, Vol 3, No 2, p 153-163, 1975. 7 fig, 4 tab, 13 ref.

Descriptors: *Phaeophyta, *Metals, *Absorption, *Path of pollutants, Sampling, *Cadmium, *Copper, *Zinc, Manganese, Trace elements, Distribution patterns, Algae, Environmental effects, Water pollution sources, Water quality, Metabolism, Toxicity, Geochemistry, Water analysis, Bioindicators, Bioassay, Mode of action.
Identifiers: *Fucus vesiculosus, *Bioaccumulation, *Bristol Channel.

Comparison of the Cadmium, Copper and Zinc contents of Fucus vesiculosus at various sites of the Bristol Channel with a detailed investigation of the dissolved trace metal concentrations to which they were subjected demonstrated a passive nature of accumulation. Consistent concentration factors were obtained over a range of mean ambient dissolved concentrations of these metals. Manganese accumulation appeared to be partially regulated. (Katz)
W77-06477

EFFECT OF SPRING FLOODS ON WATER ACIDITY IN THE KIIMINKIJOKI AREA, FINLAND,
Oulu Univ. (Finland). Dept. of Botany.
H. Haapala, P. Stepponen, and E. Meskus.
OIKOS, Vol 26, p 26-31, 1975. 5 fig, 3 tab, 22 ref.

Descriptors: *Hydrogen ion concentration, *Rivers, *Running waters, *Tributaries, *Seasons, *Melt water, *Acidity, Melting, Snow, Water quality, Soils, Peat, Pollutant identification, Path of pollutants.
Identifiers: *Finland(Kiiminkijoki River).

Acidity of the weakly-buffered river Kiiminkijoki and its tributaries was found to increase considerably during the spring. In Nuorittajoki, the largest tributary, the acidity fell to pH 5.0, while prior to flooding it was pH 6.4-6.8, and over pH 7.0 (Maximum 7.8) during the summer. Similar spring acidification occurred at all the sites tested. Increased acidity was due to abundant melt waters, generally measured at pH 4.5-5.0. River pH varied greatly at other times of the year. A strong positive correlation between pH and water level of the river was partly due to the acidifying effect of rain and melt water and to the abundance of peat in the area. (Katz)
W77-06481

TRANSPORT OF MERCURY THROUGH A LABORATORY TWO-LEVEL MARINE FOOD CHAIN,
Naval Research Lab., Washington, D. C. Ocean Sciences Div.
For primary bibliographic entry see Field 5C.
W77-06484

LEVELS OF PCBS AND DDTS IN MUSSELS FROM THE N.W. MEDITERRANEAN,
International Lab. for Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
M. Marchand, D. Vas, and E. K. Duursma.
Marine Pollution Bulletin, Vol 7, No 4, p 65-69, 1976. 3 fig, 3 tab, 20 ref.

Descriptors: *Gastropods, *Mussels, *Polychlorinate biphenyls, *DDT, *Chlorinated hydrocarbon pesticides, Absorption, Excretion, Metabolism, Path of pollutants, Mode of action, *Bioindicators, Water quality, Bioassay.
Identifiers: Mytilus galloprovincialis, *Mediterranean Sea, *Bioaccumulation, Tissue analysis.

The concentration of synthetic chlorinated hydrocarbons was monitored in mussels (MYtilus galloprovincialis) collected on the northwest Mediterranean coast. DDT and PCB contamination was found to be widespread in this region and results suggested that the mussels were directly exposed to DDT. Seasonal changes in fat content of the mussels and the unknown rates of chlorinated hydrocarbon accumulation and excretion made the detailed interpretation of data difficult and limited the prospective value of mussels as bioindicators of pollution. (Katz)
W77-06487

PCBS IN N.W. MEDITERRANEAN COASTAL WATERS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
D. Elder.
Marine Pollution Bulletin, Vol 7, No 4, p 63-64, 1976. 1 fig, 1 tab, 14 ref.

Descriptors: *Polychlorinated biphenyls, *Polychlorinated hydrocarbon pesticides, *Water pollution sources, Sea water, Water quality, Rivers, Sewage effluents, Industrial wastes, Winds, Currents(Water), Analytical techniques, *Path of pollutants, *Pollutant identification, Pesticide residues.
Identifiers: *Mediterranean Sea.

Results of sea water analysis for samples taken from eleven stations off the northwestern Mediterranean coast gave an overall average PCB concentration of 13 nannogram/1. The highest concentrations found were in samples from the coast of the Gulf of Lion, with lower concentrations in the coastal waters to the east and north, correlating with the industrial activity of the areas. The highest value obtained, 38 nanogram/1, at the mouth of the Rhone suggested that it was an important source of PCBs. Rivers, run-off, sewage, prevailing surface currents and atmospheric transport were all considered to contribute to the relative values of PCB concentration. (Katz)
W77-06488

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W77-06489

DISTRIBUTION OF LEAD, ZINC, COPPER AND MANGANESE IN THE MARINE GASTROPODS, THAIS LAPILLUS AND LITTORINA LITTOREA, AROUND THE COAST OF WALES,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
M. P. Ireland, and R. J. Wooton.
Environmental Pollution, Vol 12, p 27-41, 1977. 4 fig, 3 tab, 35 ref.

Descriptors: *Metals, *Gastropods, *Mollusks, *Mining wastes, Animal physiology, *Lead, *Zinc, *Copper, *Manganese, *Path of pollutants, Toxicity, Mode of action, Coasts, Water pollution sources, Laboratory tests, Bioassay.
Identifiers: Thais lapillus, Littorina littorea, *Bioaccumulation, Tissue analysis.

Two species of marine gastropods, Thais lapillus and Littorina littorea, were taken in the same month at nine sites around the coast of Wales and analyzed for lead, zinc, copper and manganese. Significant species and site differences could be detected and were discussed in relation to known polluted areas and species specificity for metals. Metal analysis of the digestive gland, gonad and the rest of the body in selected areas showed high levels of zinc and copper in the digestive gland, gonad of Littorina compared with Thais. The distribution of metals between digestive gland, gonad and rest of the body for one species showed variable results. The highest level of lead in both species was found in shell while the distribution of manganese was greater in the shells of Littorina than in those of Thais. The results were discussed in relation to possible food source and mineralogy of the shell, together with the presence of specific enzynme systems. (Katz)
W77-06493

SEASONAL VARIATION IN THE BIODEGRADATION OF 2,4-D IN RIVER WATER,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
J. R. Watson.
Water Research, Vol. 11, No. 2, p 153-157, 1977. 3 fig, 3 tab, 13 ref.

Descriptors: *Australia, *Water pollution sources, *Rivers, *On-site investigations, *Herbicides, *2,4-D, Foreign countries, Water analysis, Variability, Water sampling, Data collections, On-site data collections, Biodegradation, River basins, Analytical techniques, Land use, *Seasonal, Surveys, Evaluation, *Path of pollutants.
Identifiers: *Avon River, *Murray River, *North Dandalup River, Waterfall Gully.

A field investigation was made to compare the microbial breakdown of 2,4-D in water and muds collected from rivers draining the wheatbelt region with the breakdown found in similar samples collected from rivers draining purely forested catchments with no history of 2,4-D use. The experiment was designed as a pilot study, with the emphasis on locating any seasonal changes in 2,4-D degradation rates rather than on attempting to assess all contributory factors at the first attempt. The study clearly demonstrated that there is a marked difference in the stability of 2,4-D in water and mud samples from rivers with different types of land use within their catchments. Furthermore, the effect is seasonal, with maximum breakdown occurring during the winter flood condition. Although it was not possible to distinguish contributory factors in the study, a more detailed experiment currently in progress should indicate more clearly the relative contributions of microorganisms, nutrient levels, suspended sediments and on-farm practices. The study highlighted the importance of flood conditions in the removal of undesirable pollutants by natural purificantion processes. (Humphreys-ISWS)
W77-06496

SIMULATION OF PO4-P BALANCE IN A SHALLOW AND POLLUTED RIVER,
Tokyo Univ. (Japan). Inst. of Applied Microbiology.
S. Aiba, and H. Ohtake.
Water Research, Vol. 11, No. 2, p 159-164, 1977. 7 fig, 2 tab, 12 ref.

Descriptors: *Phosphates, *Model studies, *Phosphorus compounds, *Water quality, *Phosphorus, Fertilizers, Mathematics, Water pollution sources, Inorganic compounds, Pollutants, Mathematical models, Water chemistry, Rivers, Estuaries, Runoff, Diffusion, Convection, Path of pollutants.
Identifiers: *Phosphate balance, *Phosphate content, *Japan, Phosphorus sinks, Phosphorus sources, Condensed phosphates.

A sophisticated, one-dimensional model to simulate the concentration of P04-P (x,t) in a shallow and polluted river was presented; the model incorporated, other than the convection and dispersion, various physico-chemical and biochemical reactions of phosphorus sinks and sources. With reference to the field data on Tama-gawa, which penetrates through the metropolitan area of Tokyo, the model was confirmed to represent the concentration of P04-P fairly well in the mid-region, except for the mountainous origin and its estuary. A material balance of P04-P, the calculation of which is made possible from the model, reveals that about 15% of the daily phosphorus input into the region ifsfixed by algae on the river bottom, while about 54% of the input flows downstream without being fixed. The balance also discloses that phosphorus decrease due to adsorption on to suspended solid and the increase attributable to hydrolysis of condensed phosphates in the water can be disregarded, respectively. The rest of P04-P balance, amounting to about 30%, is composed of adsorption on to the river bed, seepage into the groundwater, and release from the non-viable algal decomposition. The model was also used to simulate the P04-P concentration in the region under various conditions. Though naive, the most effective means to decrease the concentration was found, from the model, to be to curtail as much as possible the phosphorus inflow from tributaries. (Henley-ISWS)
W77-06497

CHLORINE-CONTAINING PESTICIDES AND POLYCHLORINATED BIPHENYLS IN BRITISH COASTAL WATERS,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5A.
W77-06501

MANGANESE CYCLING IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,
Oregon State Univ., Corvallis. School of Oceanography.
D. W. Evans, N. H. Cutshall, F. A. Cross, and D. A. Wolfe.
Estuarine and Coastal Marine Science, Vol. 5, No. 1, p 71-80, January 1977. 4 fig, 1 tab, 14 ref. ERDA AT(49-7)-5, AT(45-1)-2227, RLO-2227-TA12-58.

Descriptors: *Estuaries, *North Carolina, *Manganese, *Circulation, On-site observations, Surveys, Sampling, Water analysis, Laboratory tests, Analytical techniques, Sediments, Water sampling, Evaluation, Tidal waters, Salinity, *Path of pollutants.
Identifiers: *Newport River estuary(NC), Manganese cycling.

Dissolved Mn was measured in the Newport River estuary, North Carolina, in October 1974, February 1975, and April 1975 by extraction on Chelex-100 resin and subsequent analysis by flameless atomic absorption spectrophotometry. Dissolved Mn concentrations at intermediate salinities were in excess of those predicted by conservative mixing of inflowing river and ocean water, with maxima between 4 and 14% salinity. Reduction and solubilization of Mn in bottom sediments in the upper estuary probably supply much of the added dissolved Mn. Fixation of dissolved Mn on particles takes place in the lower estuary, with subsequent upstream recycling. The export of dissolved Mn from the estuary in excess of that input by the river is probably balanced by continuous traction flows of river-derived bed sediment or by pulse inputs of suspended sediment in storm runoff followed by partial solubilization. (Humphreys-ISWS)
W77-06502

THE ABUNDANCES, DISTRIBUTION AND FLUX OF NUTRIENTS AND CHLOROPHYLL A IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W77-06503

APPLICATION OF THE DIACETYL-MONOXIME THIOSEMICARBAZIDE METHOD TO THE ANALYSIS OF UREA IN ESTUARINE SEDIMENTS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W77-06505

NUMERICAL MODEL OF ESTUARINE CIRCULATION,
Princeton Univ., N.J. Geophysical Fluid Dynamics Program.
A. F. Blumberg.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY3, Proceedings Paper 12815, p 295-310, March 1977. 10 fig, 19 ref, 2 append. NSF DES 74-08463, NOAA 04-3-022-33.

Descriptors: *Computer models, *Estuaries, *Mathematical models, Hydraulics, Hydrodynamics, Tidal effects, Simulation analysis, Turbulence, Waste disposal, Water pollution, Potomac River, Mixing.
Identifiers: *Potomac River estuary.

A real time numerical model was developed to predict the dynamics of partially mixed estuaries. An explicit finite difference technique which conserved mass, salt, and momentum, was used to solve the governing equations. A consistent set of vertical mixing coefficients was proposed such that an application of the model to the Potomac River Estuary produces simulations of velocity, salinity, and tidal heights comparable to field observations. The model also permits an investigation of the time variability in the magnitude of the various terms comprising the salt balance equation. (Roberts-ISWS)
W77-06519

EXPERIMENTAL STUDY OF WIND EFFECTS ON REAERATION,
National Bureau of Standards, Washington, D.C. Fluid Meters Section.
For primary bibliographic entry see Field 2L.
W77-06520

5C. Effects Of Pollution

EFFECTS OF MUNICIPAL COMPOST AND NITROGEN FERTILIZER ON SELECTED SOILS AND PLANTS,
Tennessee Valley Authority, Knoxville.
J. C. Duggan, and C. C. Wiles.
Compost Science, Vol. 17, No. 5, p 24-31, Winter, 1976. 1 fig, 13 tab, 14 ref.

Descriptors: *Sludge disposal, *Municipal wastes, *Fertilizers, *Heavy metals, Crops, Nitrogen, Soil properties, Physical properties, Chemical properties, Disposal, Rate of application.
Identifiers: Municipal compost.

The effects of different amounts and rates of application of municipal compost and chemical fertilizers on plant yield and soil properties were investigated. Test plots were monitored for cadmium, chromium, nickel, lead, zinc, and copper. Selected subplots were monitored for crop yield, uptake of heavy metals, soil bulk density, and soil moisture. The compost was fortified with sewage sludge and nitrogen fertilizer, and applied at rates of 200 tons and 160 pounds per acre. Results indicated that corn grain yields were increased and soil physical properties improved with annual compost application of 200 tons per year for five years. After compost application ended, residual corn crops still registered positive responses. No adverse effects were observed from the presence of heavy metals, but other crops might be less tolerant of them. (Collins-FIRL)
W77-06146

EFFECTS OF SEWAGE SLUDGE AND SLUDGE COMPOST APPLIED TO SOIL ON SOME SOIL PHYSICAL AND CHEMICAL PROPERTIES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
E. Epstein, J. M. Taylor, and R. L. Chaney.
Journal of Environmental Quality, Vol. 5, No. 4, p 422-426, October-December, 1976. 4 fig, 8 tab, 15 ref.

Descriptors: *Soil chemical properties, *Soil physical properties, *Soil contamination effects, *Land management, *Sludge disposal, *Sewage

sludge, Moisture content, Cation exchange, Nitrogen, Chlorides, Salinity.
Identifiers: Water retention, *Sludge compost.

A field study was conducted to determine the effects of land application of sewage sludge and sludge compost (0, 40, 80, 120, and 240 metric tons/ha) on physical and chemical soil properties and on crop growth at pH 5.5 to 6.0 and 6.5 to 7.0. The study proved that application of sludge exceeding 120 metric tons/ha were difficult and caused a cloddy seedbed, though the same rate of compost was applied easily and produced a friable seedbed. Both sludge and compost increased water content and water retention in a silt loam soil. Salinity and chloride levels were increased by both to a level which affected salt-sensitive plants. Salinity increased as application rates increased and the same results were noticed with increased chloride levels. The high increase in soil water content caused rapid decomposition of organic carbon and blocked soil pores. The compost was significantly drier and had less readily decomposable organic carbon. These conditions lead to decreased nitrification and increased denitrification and can adversely affect plant growth and root development. Heavy metals were found to be more available to plants as soil pH decreased. Nitrate-nitrogen levels were highest at the 15-20 centimeter level and sharply decreased at lower soil depths. Available phosphorus was higher than necessary for good crop growth needs. (Collins-FIRL)
W77-06164

EFFECTS OF TRACE ELEMENTS ON UREASE ACTIVITY IN SOILS,
Iowa State Univ., Ames, Dept. of Agronomy.
M. A. Tabatabai.
Soil Biology and Biochemistry, Vol. 9, No. 1, p 9-13, 1977. 4 tab, 26 ref.

Descriptors: *Nitrogen compound, *Trace elements, *Soil contamination effects, *Sludge disposal, Soil chemical properties, Soil physical properties, Soil types, Sewage effluents, Metals, Hydrogen ion concentration.
Identifiers: *Urease activity(Soils).

Sewage sludges and effluents are being increasingly disposed on agricultural land. A study was conducted to determine the effectiveness of trace elements in inhibiting urease activity in soils, the distribution of urease activity in agricultural soil profiles, and the relationship between urease activity and organic carbon in surface and soil profile samples. Soils were selected which had a wide range of pH, texture, organic matter content, and urease activity. Results showed that all trace elements studied, except As(5+) and W(6+), inhibited urease activity in the study soils. The inhibition ability of metal ions was found to be dependent upon soil chemical and physical properties. When 5 micro moles/gram of soil was used, the following ions produced inhibition in descending order of strength: Ag(+) and Hg(2+), Cu(2+), Cd(2+), Zn(2+), Sn(2+), and Mn(2+). Generally, Fe(3+) and Cu(2+) were more effective urease activity inhibitors than Fe(2+) and Cu(+). Inhibition was less effective when 0.5 micro moles/gram of soil were studied. Sodium arsenate and sodium tungstate had no effect on urease activity, indicating that sodium in other test compounds had no inhibitory effect at tested concentrations. Urease activity showed marked decreases with increased soil depths. Cropping history, soil amendments, and some environmental factors influence the activity of urease and other enzymes in soils. Seasonal variations were noted in Mississippi soils, and organic matter appeared to have a special effect on urease activity. (Collins-FIRL)
W77-06165

EFFECTS OF SEWAGE SLUDGE COMPOSITION, APPLICATION RATE, AND LIME REGIME ON PLANT AVAILABILITY OF HEAVY METALS,
Department of the Environment, Ottawa (Ontario). Office of the Science Advisor.
M. K. John, and C. J. Van Laerhoven.
Journal of Environmental Quality, Vol 5, No 3, p 246-251, July-September, 1976. 8 tab, 15 ref.

Descriptors: *Soil amendments, *Soil treatment, *Heavy metals, *Lime, *Phytotoxicity, Vegetation, Sludge disposal, Sludge digestion, Waste disposal, Cadmium, Lead, Copper, Iron, Manganese, Nickel, Zinc.
Identifiers: Milorganite.

Milorganite and air-dried primary digested sludge were applied to unlimed and limed soil to determine the effects of heavy metals on romaine lettuce and beets grown on these soils. The lettuce yield after 6 weeks was immensely improved when Iona sludge (10 grams/kilogram) or Milorganite (5 or 10 grams/kilogram) was applied. When Milorganite increased above 10 grams/kilogram, lettuce dry markedly decreased. A larger lettuce yield was obtained from limed than unlimed soil. Beet top growth was greatly enhanced when Milorganite was applied to unlimed soil (10 or 25 grams/kilogram) and to limed soil (25 to 100 grams/kilogram). Various application rates of Iona sludge did not produce results very different from that of control treatment. Addition of sludge to limed soil increased Cd concentrations in lettuce, whereas additions to unlimed soil did not affect those concentrations. Concentrations in beets did not significantly change from controls when sludge was applied to limed soil. Milorganite-borne Cd was also less available to plants from limed soil than from unlimed soil. Zinc available to plants was enhanced by sludge applications of 100 grams/kilogram, but not lower concentrations, in both soil types. Milorganite application (5 to 25 grams/kilogram) in limed soil increased Zn, but decreased Zn in unlimed soils. Data was provided on experiments with other metals. Soil pH was not significantly affected by sludge applications, but massive declines were found with milorganite applications. Higher pH values were found in limed than unlimed soil for all sludge treatments. An inverse relationship was found between soil pH and zinc and cadmium. (Collins-FIRL)
W77-06175

CADMIUM DISTRIBUTION IN FOREST ECOSYSTEMS IRRIGATED WITH TREATED MUNICIPAL WASTE WATER AND SLUDGE,
Pennsylvania State Univ., University Park. Dept. of Forestry.
For primary bibliographic entry see Field 5B.
W77-06178

MOLYBDENUM HAZARD IN LAND DISPOSAL OF SEWAGE SLUDGE,
State Univ. of New York at Binghamton. Dept. of Geological Sciences.
R. W. Lahann.
Water, Air, and Soil Pollution, Vol. 6, No. 1, p 3-8, August, 1976. 2 fig, 1 tab, 20 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Molybdenum, Physical properties, Chemical properties, Oxidation, Adsorption, Soil contamination, Hydrogen ion concentration, Metals, Water pollution sources, Disposal, Soil chemical properties, Incineration.
Identifiers: Land disposal.

Increasing costs of treatment and incineration of sludge have incited investigations for alternate disposal means. One alternative is land disposal. Accumulation of toxic substances is a great problem of land disposal techniques. A study was conducted on the effects of molybdenum (Mo). The substance is mobile in neutral to alkaline systems, readily concentrated by plants, and in excess, can cause metabolic disorders in animals. Results of field studies indicated Mo concentrations in strip mine spoil materials discharge water were 300 micrograms/liter, excessive of the world-wide fresh water average (1.2 micrograms/liter). Dissolved Mo was adsorbed by the precipitate when acid water encountered water with a more normal pH. Oxidation and adsorption were extensive and resulted in Mo-rich oxides and hydroxides within the spoils. Oxygen free conditions should be maintained to prevent oxidation of pyritic spoil materials. Soil pH increases or the dissolution of Fe or Mn oxides can cause introduction of large amounts of Mo into groundwater. The molybdenum release rate following sludge release should decline as exchangeable Mo is flushed, and as soluble phases are removed, from the system. The short-term magnitude of concentration increase is probably a function of the length of oxidizing exposure, sludge application rate, and groundwater movement rate. Increased soil pH should increase Mo solubility. (Collins-FIRL)
W77-06180

EFFECTS OF ANNUAL AND ACCUMULATIVE APPLICATIONS OF SEWAGE SLUDGE ON ASSIMILATION OF ZINC AND CADMIUM BY CORN (ZEA MAYS L.),
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
T. D. Hinesly, R. L. Jones, E. L. Ziegler, and J. J. Tyler.
Environmental Science and Technology, Vol. 11, No. 2, p 182-188, February, 1977. 5 fig, 5 tab, 15 ref.

Descriptors: *Phytotoxicity, *Zinc, *Cadmium, *Corn(Field), Sludge disposal, Chemical properties, Metals, Sludge digestion, Anaerobic digestion, Fertilizers, Soil chemistry, Nitrogen, *Absorption, *Sewage sludge.

Field studies were conducted to determine the applicability of heated anaerobically digested sludge as a fertilizer and a soil amendment. Sixteen chemical elements were monitored, but only zinc and cadmium results were reported because they are always present in municipal waste water sludges at levels higher than in agricultural soils and in forms which can readily be assimilated and deposited in plant tissues. They also present the most obvious phytotoxic and animal health hazard. The tests revealed that the organic portions of sludge mixed with soil were not a great factor in the protection of plants against excessive soil concentrations of zinc and cadmium. Annual application of these elements as sludge components varied depending upon the depth of sludge applied during the growing season and the concentration of solids in the digested sludge. Application of digested sludge at just adequate rates for nitrogen supplementation for corn would not present a hazardous Zn or Cd concentration. Most favorable responses to sludge application were at those times when the weather was unfavorable for corn growth. Results suggest that organic components or decompositional products of soil-incorporated sludge organic matter can temporarily maintain applied Zn and Cd in forms available for absorption by plant roots. Conditions were maximized for the absorption and translocation of cadmium to grain, but no concentrations of cadmium in one-fourth maximum-treated plots ever exceeded those of more normal environments. (Collins-FIRL)
W77-06181

THE BIODEGRADATION OF POLYETHYLENE GLYCOLS BY SEWAGE BACTERIA,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
For primary bibliographic entry see Field 5D.
W77-06211

MACROINVERTEBRATE COLONIZATION OF SPARTINA MARSHES ARTIFICIALLY ESTABLISHED ON DREDGE SPOIL,
North Carolina State Univ., Raleigh. Dept. of Zoology.
L. M. Cammen.
Estuarine and Coastal Marine Science, Vol. 4, p. 357-372, 1976, 8 fig., 5 tab., 32 ref.

Descriptors: *Marshes, *Dredging, *Spoil banks, Productivity, Growth rates, Plant growth, Biomass, Sediments, Sedimentation rates, Ecology, Eco-systems, Invertebrates, Population, Distribution, Patterns, Environmental effects, Food webs, *North Carolina.
Identifiers: *Spoil fauna, *Spartina alterniflora, Diversity, *Dredge spoil, Drum inlet(NC), Snow's cut(NC).

Core samples were taken from dredge spoil planted with Spartina alterniflora, spoil left bare and nearby natural marsh in two locations in order to determine the factors influencing the development of the spoil fauna and to investigate the relationship of the spoil fauna with the natural marsh fauna. Based on calculation of total numbers, total biomass, sample diversity and species richness, and faunal affinity between plots, the difference in elevation between the bare and planted spoil plots appeared to be the major factor determining the degree of similarity in their fauna. Five factors were suggested to control the development of the planted spoil fauna: the similarity of the spoil to natural marsh in elevation and sediment particle size, the natural sedimentation rate in the area, the proximity of the spoil to natural marsh and the relative maturity of the natural marsh faunal community. (Katz).
W77-06253

RESPONSES OF AN ESTUARINE POPULATION OF THE BLUE MUSSEL MYTILUS EDULIS TO HEATED WATER FROM A STEAM GENERATING PLANT.
Environmental Research Lab., Narragansett, R. I.
J. G. Gonzalez, and P. Yevich.
Marine Biology, vol. 34, p. 177-189, 1976. 4 fig., 2 tab., 12 ref.

Descriptors: *Gastropods, *Mollusks, *Mussels, *Water quality, *Heated water, *Water pollution sources, *Water Temperature, *Estuaries, *Thermal pollution, Thermal water mortality, Animal physiology, Water pollution effects, Environmental effects, Thermal powerplants, *Rhode Island, Bays.
Identifiers: *Blue mussel, Mytilus edulis, Histology, Epithelium, Morphology, *Narragansett Bay(RI).

During the months of June and August, 1971, beds of blue mussel Mytilus edulis (5,000 individuals/m2) in the effluent canal of a steam generating plant died when temperatures rose above 27 degrees C. Laboratory studies showed that M. edulis could not tolerate continuous temperatures above 27 dergees C, and feeding stopped shortly after the mussels were exposed to 25 degrees C. According to histopathological studies the cause of death was associated with degeneration of the frontal and laterofrontal cilia of the columnar epithelium of the gill filaments. Necrosis and sloughing of the epithelium of the intestinal diverticula was noted as well as extensive amoebocytic infiltration in the byssogenous cavity, gill filaments and stomach wall. (Katz).
W77-06254

CADMIUM AND ZINC TOXICITY TO FLAGFISH, JORDANELLA FLORIDAE,
Environmental Research Lab.-Duluth, Minn.
R. L. Spehar.
Journal of the Fisheries Research Board of Canada, Vol 33, p 1939-1945, 1976. 1 fig, 3 tab, 22 ref.

Descriptors: *Metals, *Toxicity, *Cadmium, *Zinc, Lethal limit, Bioindicators, Growth rates, Growth stages, Path of pollutants, Fish physiology, Fish reproduction, Metabolism, Environmental effects, Absorption, Mortality, Laboratory tests.
Identifiers: Bioaccumulation, *Flagfish, Jordanella floridae, Survival rates, Tissue analysis.

Cadmium and zinc toxicity to the flagfish (Jordanella floridae) was determined on the basis of 96-h median lethal concentrations (LC50) and significant decreases (P = 0.05) in survival, growth, and reproduction over the complete life cycles of the fish. The 96-h LC50 values for cadmium and zinc to juvenile flagship were 2500 and 1500 micrograms/liter, respectively. In chronic tests, reproduction was the most sensitive indicator of cadmium toxicity and was inhibited at 8.1 micrograms/liter. Tissue-concentration analysis showed that fish exposed to concentrations of 1.7 micrograms/liter and above accumulated significantly greater amounts of cadmium than those in the controls. In zinc tests, survival of larvae (not exposed as embryos) and growth of females were the most sensitive measure of zinc toxicity and were reduced at respective concentrations of 85 and 51 micrograms/liter. Significant uptake of zinc occurred in fish exposed to concentrations of 47 micrograms/liter and above. The lowest cadmium and zinc concentrations causing adverse effects to the flagship were similar to those affecting other fish species. Application factors for both metals were similar to those reported for cadmium exposed bluegills (Lepomis macrochirus) and zinc exposed fathead minnows (Pimephales promelas) in hard water. (Katz)
W77-06255

REDUCTION OF AQUATIC TOXICITY OF LINEAR ALKYLBENZENE SULFONATE (LAS) BY BIODEGRADATION,
Monsanto Co., St. Louis, Mo.
R. A. Kimerle, and R. D. Swisher.
Water Research, Vol 11, p 31-37, 1977. 4 fig, 3 tab, 23 ref.

Descriptors: *Toxicity, *Sulfonates, *Alkylbenzene sulfonates, *Linear alkylate sulfonates, *Indicators, *Metabolism, *Biodegradation, *Chemical degradation, *Absorption, *Daphnia, Dyes, Minnows, Environmental effects, Water quality, Water fleas, Water pollution control.
Identifiers: *Linear alkylbenzene sulfonate, Daphnia magna, *Pimephales promelas, *Methylene blue active substances, Methylene blue, Bioaccumulation, Tissue analysis, Intermediates.

Partial biodegradation of Linear Alkylbenzene Sulfonate (LAS) was shown to significantly reduce the specific toxicity of the remaining LAS to water fleas (Daphnia magna) and fathead minnows (Pimephales promelas). The longer homologs and more terminal isomers were more toxic but also were more rapidly degraded under bacterial action. A further contribution to the reduction of toxicity was projected to occur if the methylene blue analytical method was used to determine the amount of LAS remaining, since some of the biodegradation intermediates showed methylene blue activity but no significant toxicity. The results emphasized that analysis simply for methylene blue active substances (MBAS) gave no basis for predicting the aquatic toxicity of an environmental sample, and that meaningful water quality criteria and standards cannot be established in terms of MBAS content while based on undegraded LAS studies. (Katz)
W77-06256

THE DETERMINATION OF TRACE METALS IN CLADOPHORA GLOMERATA -- C. GLOMERATA AS A POTENTIAL BIOLOGICAL MONITOR,
Queen's Univ., Kingston (Ontario). Dept. of Chemistry.
W. L. Keeney, W. G. Breck, G. W. Vanloon, and J. A. Page.
Water Research, Vol 10, p 981-984, 1976. 2 tab, 23 ref.

Descriptors: *Metals, *Trace elements, Water analysis, *Bioindicators, *Algae, Metabolism, Path of pollutants, Water quality, Zinc, Cadmium, Lead, Copper, Primary productivity, Methodology, Analytical techniques, Monitoring, *Pollutant identification, *Cladophora.
Identifiers: Bioaccumulation, Cladophora glomerata, *Biological monitors.

A differential pulse anodic stripping voltammetry was developed for the determination of Zn, Cd, Pb, and Cu in Cladophora glomerata. The method was applied to samples taken from a remote island in lake Ontario and a shore site near Kingston. Trace metal contents and concentration factors for the two samples were determined. C. glomerata was recommended as a bioindicator which concentrated the trace metals present in the aqueous environment with a constant concentration factor for each element. (Katz)
W77-06257

ACUTE AND CHRONIC TOXICITY OF COPPER TO FOUR SPECIES OF DAPHNIA,
Miami Univ., Oxford, Ohio. Dept. of Zoology.
R. W. Winner, and M. P. Farrell.
Journal of the Fisheries Research Board of Canada, Vol 33, p 1685-1691, 1976. 2 fig, 3 tab, 15 ref.

Descriptors: *Daphnia, *Waterfleas, *Plankton, *Invertebrates, Metals, *Copper, *Toxicity, *Toxins, *Zooplankton, Mortality, Lethal limit, Growth rates, Population, Bioassay, Reproduction, Path of pollutants, Growth stages, Environmental effects, Mode of action.
Identifiers: Bioaccumulation, Sensitivity, *Survival rates(Daphnia), Daphnia magna, Daphnia pulex, Daphnia parvula, Daphnia ambigua.

The sensitivity of Daphnia magna, D. pulex, D. parvula, and D. ambiqua to acute and chronic copper stresses was evaluated under laboratory conditions. Using 72-h LC50 values as the index, the two larger species were significantly less sensitive to an acute copper stress than were the two smaller species. All four species exhibited reductions in survival at Cu concentrations > 40 micrograms/liter. Daphnia magna exhibited a decrease in the instantaneous rate of population growth (r) at Cu concentrations > 60 micrograms/liter: r decreased in the other three species at concentrations > 40 micrograms/liter. Daphnia ambigua produced significantly smaller broods at Cu concentrations > 40 micrograms/liter, whereas mean broad sizes did not decrease in D. pulex and D. parvula until the Cu concentration exceeded 60 micrograms/liter. Daphnia magna did not exhibit any reduction in mean brood size related to copper concentration: reproduction in this latter species was inhibited only as a consequence of females dying before they reached reproductive maturity at concentrations > 80 micrograms/liter. Application factors, based on the highest concentration did not reduce survival and 72-h LC-50 values, ranged from 0.47 to 0.59 and were not significantly different for the four species. It was concluded that the four species do not differ in their susceptibility to a chronic copper stress. (Katz)
W77-06258

EFFECT OF DIETS CONTAINING DOGFISH (SQUALUS ACANTHIAS) MEAL ON THE MERCURY CONTENT AND GROWTH OF PEN-

REARED COHO SALMON (ONCORHYNCHUS KISUTCH),
National Marine Fisheries Service, Seattle, Wash. Pacific Utilization Research Center.
J. Spinelli, and C. Mahnken.
Journal of the Fisheries Research Board of Canada, Vol 33, p 1771-1778, 1976. 4 fig, 3 tab, 23 ref.

Descriptors: *Mercury, *Salmonids, *Metabolism, *Fish diets, Juvenile fish, Fish physiology, *Growth rates, Bioassay, Biochemistry, Lethal limit, Laboratory tests, Chemical reactions, Chelation, Aquiculture, *Fish food organisms.
Identifiers: *Dogfish, Squalus acanthias, *Coho salmon, Bioaccumulation, Tissue analysis, Tolerance level, Fish production, Dogfish meal.

The use of dogfish (Squalus acanthias) meal as a complete replacement for herring or other low mercury content fish meal introduced the risk of producing fish that exceed the FDA tolerance level of 0.5 ppm Hg. The amount of Hg that accumulated in the muscle was related not only to the total Hg content of the fish, but also to that of the diet and to other diet constituents that react with Hg in the diet. Results indicated that dogfish meal could be used as a partial (50%) replacement for the fish meal portion of the diet without exceeding 0.5 ppm Hg values in the muscle. No evidence was found that naturally occurring chelating agents in dehydrated orange peel or polygalacturonic acid-cellulose complexes had the ability to chelate and prevent the deposition of Hg in either the muscle or the liver of the fish. Coho salmon (Oncorhynchus kisutch) fed diets in which 50% of the herring was replaced with dogfish meal decreased in growth. (Katz)
W77-06259

A FISH-REARING SYSTEM INCORPORATING CAGES, WATER CIRCULATION, AND SEWAGE REMOVAL,
Southern Illinois Univ. at Carbondale. Fisheries Research Lab.; and Southern Illinois Univ. at Carbondale. Dept. of Zoology.
W. M. Lewis, and L. W. Wehr.
The Progressive Fish-Culturist, vol. 38, no. 2, p-78-81, April 1976. 3 fig., 1 tab., 1 ref.

Descriptors: *Biochemical oxygen demand, *Aquiculture, *Catfish, *Fish farming, *Productivity, *Sewage, Technology, *Design, Equipment, Filters, Fish Harvest, Fish handling facilities, Self-Purification, Sewage Effluents, Trickling filters.
Identifiers: *Biofilters, *Cages(Catfish).

To increase the carrying capacity of a closed water system, the use of cages that allow the removal of solid waste from hatchery ponds and consequently decrease the biochemical oxygen demand was tested. A system was designed consisting of wire mesh cages with a cone-shaped, fiber glass bottom with an outlet for harvesting and for sewage removal. Water circulated through the cages and out the bottom into a sedimentation tank with the overflow discharging through a vegetated canal. After testing with catfish, recommended changes consist of replacing the canal with a conventional biofilter and removing the sedimentation tank. The system proved satisfactory for maintaining low BOD values and for ease of harvesting. The estimated maximum loading rate for the system was 3,000 kg of catfish per hectare in cages plus 1,000 kg of fish per hectare in the pond outside the cages. This system would allow for polyculture with planktivorous fish living outside the cages. (Katz)
W77-06260

COMPARISON OF SEA WATER WITH FRESH WATER IN REARING CHUM SALMON SMOLTS,
Washington State Dept. of Fisheries, Olympia.
H. G. Senn, and R. Hager.
The Progressive Fish-Culturist, vol. 38, no. 2, p. 108-109, April 1976. 2 tab., 2 ref.

Descriptors: *Fish management, Environmental effects, *Aquiculture, *Sport fish, *Fish hatcheries, *Fry, *Salinity, *Chum salmon, *Commercial fish, Sea water, Fish farming, Juvenile fish, Fisheries, Salmon, Salmonids, *Washington, Anadromous fish, Freshwater.
Identifiers: *Hood Canal Salmon Hatchery(Wash).

Successful chum salmon production in salmon hatcheries is believed to be related to the use of sea water during the last 3 weeks of rearing. To test this possibility chum salmon fry were exposed to a salinity level of 18 o/oo after 39 days of rearing and maintained at this level for the rest of the 57-day rearing period. This group was marked and released with a control group raised in freshwater. An additional group was marked and released after 35 days of rearing, at the beginning of the investigation. Analysis of returning adults after 3 and 4 years suggests that the survival to maturity of chum salmon smolts reared in fresh water before release is similar to that of smolts reared in mixed fresh and sea water. The study indicates that additional rearing time increases survival to maturity, as suggested by the low return of the early release group. (Katz)
W77-06261

THE USEFULNESS OF LYNMAEA STAGNALIS AS A BIOLOGICAL INDICATOR IN TOXICOLOGICAL BIO-ASSAY (MODEL SUBSTANCE ALPHA-HCH),
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Toxicology.
J. H. Canton, and W. Slooff.
Water Research, vol. 11. p. 171-121, 1977. 2 fig., 7 tab., 20 ref.

Descriptors: *Bioindicators, *Snails, *Toxicity, *Organic compounds, *Chlorinated hydrocarbon pesticides, Pollutant identification, Reproduction, Fecundity, Animal physiology, Metabolism, Path of pollutants, Bioassay, Toxicity, Lethal limit, Mortality, Growth stages, Daphnia, Zooplankton, Laboratory tests, Life cycles, Growth rates, Environmental effects, Path of pollutants, *Bioindicator.
Identifiers: Bioaccumulation, *Pond snails, Lymnaea stagnalis, Tissue analysis, *Alpha-hexachlorocyclohexane.

Short- and long-term studies with alpha-hexachlorocyclohexane (alpha-HCH) were carried out on the pond snail (Lymnaea stagnalis) to determine its potential as a bioindicator in surface water. In the long-term 70-day study, an inverse time-independent relation was found between egg producing rate and the HCH concentration in water. The percentage of fertilized eggs per capsule was not affected. No morphological abnormalities were noticed during the embryonic development, although a significantly dose-related delay occurred with respect to the hatching of the eggs. The combination of the inhibition of the egg-production of the adult snails and the mortality of the young during their development caused a 50% reduction of the overall reproductivity. The heart-rate of newborn snails was slowed significantly by HCH. Replacing the snails into an HCH-free medium for 16 days, after a 40-day exposure did not reverse the effects. The susceptibility of Lymnaea stagnalis to alpha-HCH did not differ much from that of Daphnia magna. This organism proved to be the most sensitive one of all tested organisms (Chlorella, Daphnia, Lebistes, Salmo) in previous studies with HCH. (Katz)
W77-06262

UPTAKE OF COPPER BY THE POLYCHAETE CIRRIFORMIA SPIRABRANCHA IN THE PRESENCE OF DISSOLVED YELLOW ORGANIC MATTER OF NATURAL ORIGIN,
California Univ., Livermore. Biomedical and Environmental Research Div.
F. P. Milanovich, R. Spies, M. S. Guram, and E. D. Sykes.
Estuarine and Coastal Marine Science, vol. 4, p. 585-588, 1976. 1 tab., 1 fig., 9 ref.

Descriptors: *Absorption, *Copper, *Metals, *Worms, *Annelids, *Organic compounds, *Toxicity, Bioassay, Environmental effects, Path of pollutants, Laboratory tests, Animal physiology, Metabolism, Ecosystems, Water pollution, Chemical reactions, Decomposing organic matter, *California.
Identifiers: *Polychaetes, *Cirriformia spirabracha, *Yellow organics, Bioaccumulation, Tissue analysis, Tomales Bay(Calif).

The toxicity of copper to the polychaete Cirriformia spirabracha was investigated and the accumulation of copper in the tissues was determined. Dissolved yellow organic substances were shown to have no effect on the rate of copper uptake by the worms in seawater media. Discussion of the implications of the results was presented. (Katz)
W77-06263

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. Windom, W. Gardner, J. Stephens, and F. Taylor.
Estuarine and Coastal Marine Science, vol. 4, p. 579-583, 1976. 2 tab., 13 ref.

Descriptors: *Estuaries, *Mercury, *Sediments, *Metals, *Ecosystems, *Salt marshes, *Marsh plants, *Primary productivity, Toxicity, Water pollution sources, Path of pollutants, Water pollution, Estuaries, *Georgia.
Identifiers: *Spartina alterniflora, *Littorina irrorata, *Uca sp., *Methylmercury, Brunswick coast(Geo).

A salt marsh estuary which received large discharges of inorganic mercury for several years was evaluated for the occurrence and production of methylmercury. The methyl form was not detected in marsh sediments or marsh vegetation (Spartina alterniflora). Significant concentrations were detected in the dominant primary consumers (Littorina irrorata and Uca sp.). Assuming these organisms accumulated a significant percentage of the methylmercury produced in the salt marsh ecosystem, its annual production was estimated at 50 micrograms/gram of total mercury in the upper 5 cm of the sediment column. (Katz)
W77-06264

THE DISTRIBUTION OF PB, ZN, CD, AND CU WITHIN THE PULMONATE MOLLUSC HELIX ASPERSA MULLER,
Bristol Univ. (England). Dept. of Botany.
P. J. Coughtrey, and H. M. Martin.
Oecologia, vol. 23, p315-322, 1976. 4 tab., 35 ref.

Descriptors: Animal physiology, *Mollusks, *Metals, *Cadmium, *Zinc, *Lead, *Copper, Path of pollutants, Absorption, Metabolism, Laboratory tests, Analytical techniques, Bioassay, *Distribution.
Identifiers: Bioaccumulation, Helix aspersa, Tissue analysis.

The digestive gland of the mollusc Helix aspersa was shown to be an important store of Pb, Zn and Cd while Cu was more evenly distributed throughout the tissues of the animal. The selectivity of the digestive gland for Cd was higher than for Pb and Zn and analysis of the digestive gland for studying levels of Cd at different sites was suggested. At a contaminated site the levels of cadmium in H. aspersa were 13 times greater than at a relatively uncontaminated site. (Katz)

W77-06265

PRESENCE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS (PCB) IN ARCTIC AND SUBARCTIC MARINE FOOD CHAINS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemicals Section.
For primary bibliographic entry see Field 5B.
W77-06266

DIRECT AND INDIRECT EFFECTS OF OIL ON RINGED SEALS (PHOCA HISPIDA) OF THE BEAUFORT SEA,
Ontario Veterinary Coll., Guelph.
J. R. Geraci, and T. G. Smith.
Journal of the Fisheries Research Board of Canada, vol. 33, p. 1976-1984, 1976. 3 fig., 32 ref.

Descriptors: *Water pollution sources, *Animal physiology, Mammals, *Wildlife, *Oil, *Oil pollution, Toxicity, Toxins, Environmental effects, Mode of action, Mortality, Path of pollutants, Laboratory tests, Fuels.
Identifiers: *Seals, *Ringed seals, Phoca hispida, Ontario, Tissue analysis, Bioaccumulation, Norman Wells crude oil, White coat harp seal, Phoca groenlandica, *Beaufort Sea.

Ninety-six ringed seals (Phoca hispida) were taken from nets at Brown's Harbour, Northwest Territories in the fall of 1974. Comparison with two other net samples from 1971 and 1972 revealed a lower proportion of young-of-the-year and a lower mean weight of seals in all age-classes. Six seals immersed in Norman Wells crude oil for 24h at the field netting site suffered only transient eye problems and minor kidney and possibly liver lesions; no permanent damage was observed. Three seals transported to the University of Guelph all died with 71 minutes after oil was introduced into their pool. Hematologic and blood chemical studies indicate that death was caused by oil superimposed on the stress of captivity. Six 3-4 week-old wild whitecoat harp seal (P. groenlandica) pups at the Magdalen Islands, Quebec, were coated with crude oil. No significant differences in core body temperatures were noted and no deleterious effects were observed. Five captive ringed seals at Guelph were subjected to a cumulative dosage of Norman Wells crude oil fed with their fish food. High dosage (75 ml) and low dosage (25 ml) of crude oil were also fed to two groups of six harp seal pups. No significant lesions or behavioral changes were noted. These experiments were of an acute nature and reflect the effects of a brief contact with oil only. Effects of longer contact as would probably be the case in an offshore oil well blowout situation were discussed. Possible effects of large-scale offshore oil fields were also considered. (Katz)
W77-06267

COMMUNITY AND SPECIES RESPONSES OF CHIRONOMIDAE (DIPTERA) TO CONTAMINATION OF FRESH WATERS BY CRUDE OIL AND PETROLEUM PRODUCTS WITH SPECIAL REFERENCE TO THE TRAIL RIVER, NORTHWEST TERRITORIES,
Fisheries and Marine Service, Winnipeg (Manitoba).
D. M. Rosenberg, and A. P. Wiens.
Journal of the Fisheries Research Board of Canada, Vol. 33, p 1955-1963, 1976. 6 tab, 37 ref.

Descriptors: *Oil pollution, Water pollution sources, Ecosystems, *Diptera, Freshwater, *Invertebrates, *Insects, Algae, Biomass, Path of pollutants, Biological communities, Environmental effects, Growth rates, Food chains, *Bioindicators, Population, Bioassay, Ecology, *Canada, *Oil wastes.
Identifiers: *Chironomidae, *Tanypodinae, Nilotanypus fimbriatus, Cricotopus bicinctus, Cricotopus varipes, *Trail River(NWT).

On oiled and unoiled artificial substrates in the Trail River, Northwest Territories, communities of Chironomidae were different during open-water periods but were similar over the winter. Greater numbers of species and individuals of Orthocladiinae occurred on the oiled than on the unoiled artificial substrates. The reverse was true for Tanypodinae and Chironominae. Ten species of Chironomidae showed a positive response to the presence of oil, 9 species showed a negative ponse, and 10 species were apparently unaffected. Based on the results of this study and a literature review, 11 species of Chironomidae showing either positive or negative responses to contamination by oil or petroleum products were evaluated for their potential to indicate oil contamination of freshwater ecosystems. Three criteria were used: taxonomic soundness, wide zoogeographic distribution, and numbers in the community. It was predicted that Cricotopus bicinctus (Meig.) and C. varipes Coq., individually or an an assemblage, would fulfill this role. (Katz)
W77-06270

HEAVY METALS IN ANIMALS FROM THE NORTH EAST COAST,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
D. A. Wright.
Marine Pollution Bulletin, Vol. 7, No. 2, p 36-38, 1976. 1 fig, 2 tab, 11 ref.

Descriptors: Metals, Path of pollutants, *Absorption, *Crustaceans, *Fish, Shrimp, Crabs, Laboratory tests, *Cadmium, *Zinc, *Copper, *Nickel, Bays, Water quality, Water analysis, Bioindicators, Animal physiology, *Heavy metals, *Pollutant identification.
Identifiers: *Bioaccumulation, *Shore crabs, Viviparous blennies, *Cod, *Haddock, *Dabs, Carcinus maenas, Zoarces viviparus, Crangon vulgaris, Leander serratus, Gadus morrhua, Gadus aeglefinus, Pleuronectes limanda, Tissue analysis, *England(Northeast coast).

High metal levels were reported in the tissues of fish and crustaceans from the inshore waters off the Northumberland coast, an area of little contamination. High concentrations of cadmium, zinc, copper, nickel and especially zinc were noted. Specimens analyzed included shore crabs, viviparous blennies, shrimp, cod, haddock and dabs. (Katz)
W77-06271

THE ERYTHROCYTE TRANSPORT AND TRANSFER OF METHYLMERCURY TO THE TISSUES OF THE RAINBOW TROUT (SALMO GAIRDNERI),
State Univ. of New York at Buffalo. Dept. of Biochemistry.
F. J. Giblin, and E. J. Massaro.
Toxicology, Vol. 5, p 243-254, 1975. 6 fig, 2 tab, 21 ref.

Descriptors: *Mercury, *Salmonids, *Rainbow trout, *Fish physiology, *Path of pollutants, Amino acids, Biochemistry, Chemical reactions, Metabolism, Absorption, Laboratory tests, Analytical techniques.
Identifiers: *Erythrocyte transfer, *Methylmercury, Bioaccumulation, Tissue analysis, Chemical mechanisms.

Methylmercury (MeHg) was taken up rapidly and almost completely by trout red blood cells (RBC) both in vitro and in vivo. The binding of MeHg within the RBC was freely reversible in vitro, as shown by the efflux of MeHg from RBCs suspended in protein solutions, and in vivo following intracardial (i.c.) injection of RBC-bound MeHg. Hemoglobin (Hb) appeared to be the main MeHg transport protein in trout blood since it bound 90% of whole blood Hg following an intragastric dose of Me203HgC1. MeHg, injected i.c. as MeHgS-cysteine, was present in blood bound almost completely to hemoglobin 10 days post-injection. This suggested an ability of hemoglobin to compete for and bind MeHg bound to other sulfhydryl (-SH) compounds. The number of reactive -SH groups per molecule of trout HB was determined to be 4 by amperometric titration with MeHgC1. The concentration of Hb reactive -SH groups in the trout RBC was calculated to be at least 20mM. This accounted for the high affinity of the RBC for MeHg. (Katz)
W77-06273

INFLUENCE OF OXYGEN TENSION ON METABOLIC RATE OF MACROBENTHOS SPECIES OF WESTERN BALTIC AND KATTEGAT, (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
R.-R. Dries.
Keiler Meeresforschungen, Vol 31(1), p 49-57, 1975. 5 fig, 1 tab, 18 ref.

Descriptors: *Oxygen requirements, *Benthos, Marine animals, Sediments, Metabolism, *Dissolved oxygen, Respiration, Animal physiology, Biochemistry, Habitats, Animal behavior, Mollusks.
Identifiers: Oxygen tension, *Kattegat, Hypoxia, *Baltic Sea(Western area), North Sea.

The oxygen consumption of several macrobenthic species of the Western Baltic and Kattegat was measured in dependence of oxygen tension. The examined inhabitants of soft sediments, poor in oxygen demonstrate low metabolic rates and an ability to regulate oxygen consumption down to critical partial pressures of less than 10%. In species of well aerated biotopes, metabolic rates increase and the ability of respiratory regulation is reduced. With increasing mobility animals increase their metabolic rates. The ability of respiratory regulation needs not to be affected by this. (Katz)
W77-06274

THE REACTION OF THE HYPOTHALAMIC-HYPOPHYSEAL NEUROSECRETORY SYSTEM OF THE GUPPY (LEBISTES RETICULATUS) TO AN ALTERATION OF AMBIENT TEMPERATURE,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. Ye. Matey.
Journal of Ichthyology, Vol 15, No 5, p 775-781, 1975. 4 fig, 2 tab, 16 ref.

Descriptors: *Water temperature, *Enzymes, *Fish physiology, Freshwater fish, Thermal pollution, Water pollution effects, *Animal physiology, Biochemistry, Laboratory tests, Environmental effects, Mode of action.
Identifiers: Guppy, *Lebistes reticulatus, Neurosecretory systems, Histology, Stress reaction, *Ambient temperature.

An investigation has been made of the influence of increase and reduction in the ambient temperature on the functional activity of the hypothalamic-hypophyseal neurosecretory system (HHNS) of the guppy (Lebistes reticulatus). It is demonstrated that a 10 degree reduction of temperature causes inhibition of the functional activity of the hypothalamus-pituitary system accompained by deposition of neuro-secretion in all its parts. The reaction of the HHNS to an increase in temperature is of a biphasic nature. Cellular elements play an active part in development of the stress reaction induced by a thermal stimulus. (Katz)
W77-06275

EFFECT OF SOME HERBICIDES ON FRESHWATER ALGAE,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
For primary bibliographic entry see Field 5G.
W77-06277

OCCURRENCE OF TUMOR-BEARING DOVER SOLE (MICROSTOMUS PACIFICUS) OFF POINT ARGUILLO, CALIFORNIA AND OFF BAJA, CALIFORNIA, MEXICO,
South California Coastal Water Research Project, El Segundo.
M. J. Sherwood, and A. J. Mearns.
Transactions of the American Fisheries Society, 1976 (4), p 561, 563, 2 fig, 1 tab, 13 ref.

Descriptors: *Fish diseases, *Marine fish, *Demersal fish, *Fish diseases, Trawling, *California, Pacific Coast Region, Juvenile fish, Waste disposal, Effluents, Commercial fish, *Animal pathology, *Mexico.
Identifiers: *Dover sole, Microstomus pacificus, Epidermal tumors, Museum collections, *Baja California.

Twelve Dover sole (Microstomus pacificus Lockington) with epidermal tumors have been located in museum collections of specimens from coastal waters off Central California and off Baja California, Mexico. Data from these specimens extend the known range of tumor-bearing flatfish south along the Pacific Coast of North America and document the offurrence of affected specimens in areas distant from sources of waste discharge. (Katz)
W77-06278

EXPERIMENTAL STUDY OF THE NITROGEN EXCRETION OF BASS (DICENTRARCHUS LABRAX) DURING GROWTH. II. EFFECTS OF STARVATION ON THE EXCRETION OF AMMONIA AND UREA, (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
O. Guerin-Ancey.
Aquaculture, Vol 9, p 187-194, 1976. 4 fig, 16 ref.

Descriptors: Freshwater fish, *Bass, *Nitrogen, *Ammonia, *Ureas, Water temperatures, Age, Juvenile fish, Laboratory tests, Seasonal, *Fish physiology, Fish behavior, Animal physiology, *Animal metabolism.
Identifiers: Dicentrarchus labrax, *Endogenous nitrogen, Excretion rate, Starvation.

The effects of starvation and temperature on ammonia and urea excretion in the bass (Dicentrarchus lbrax L.; groups 0, 1 and 2) were examined for fishes acclimated to 16, 18 and 20 degrees C. Ammonia and urea excretion decreased during the 7-day period of starvation to a constant: the Endogenous Nitrogen Excretion (ENE). ENE is 72 mg N per kg per 24 h of ammonia and 12 mg N per kg per 24 h of urea. ENE is the same for age groups 0, 1 and 2 and occurs later at 16 degrees C than at 20 degrees C. The percentage of urea excreted increased during the starvation period. Nitrogen reserves were calculated to be greater in younger fish and in autumn. (Katz)
W77-06279

DEER HABITAT RESPONSE TO IRRIGATION WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. Dept. of Zoology.
R. L. Dressler, and G. W. Wood.
Journal of Wildlife Management, Vol 40(4), p 639-644, 1976. 2 tab, 14 ref.

Descriptors: *Deer, *Waste water disposal, Sprinkler irrigation, *Irrigation effects, Fertilization, Plant growth, Forest management, *Forages, *Forage palatability, Grazing, On-site investigations, *Pennsylvania.
Identifiers: *White-tailed deer, Odocoilus virginianus, Ice damage.

The influence of wastewater irrigation on the quantity and quality of forage production and white-tailed deer (Odocoileus viriginianus) feeding response was studied in central Pennsylvania. Little difference was found in the amounts of available forage during the early spring months. During the growing season the production of palatable forage on the irrigated site was considerably less than on the non-irrigated site. Concentrations of crude protein, P, K, and Mg in forage generally were increased by irrigation as was percent digestible dry matter. Observations of semi-free ranging lead deer did not indicate any deterrence from use of the site due to wastewater irrigation. (Katz)
W77-06280

EFFECT OF MIREX ON PREDATOR-PREY INTERACTION IN AN EXPERIMENTAL ESTUARINE ECOSYSTEM,
Environmental Research Lab., Gulf Breez, Fla.
M. E. Tagatz.
Transactions of the American Fisheries Society, 1976 (4), p 546-549, 1 tab, 13 ref.

Descriptors: Insecticide, *Halogenated pesticides, *Food web, *Animal behavior, Biological communities, Pesticide kinetics, Water pollution effects, Path of pollutants, *Estuarine environment, Marine fish, *Shrimp, Laboratory tests.
Identifiers: Turtle grass, *Grass shrimp, Palaemonetes vulgaris, *Pinfish, Lagodon rhomboides, *Mirex, *Behavioral toxicity index.

Tests of 14- to 16-days duration were conducted to determine the distribution and sublethal effects of mirex in an experimental estuarine ecosystem. The insecticide was translocated from water at concentrations of 0.011 to 0.13 micrograms per liter to sand, plant, and animal components. An alteration of predator-prey interaction due to mirex was manifested by a significant difference (X2 test, a=0.05) in survival of grass shrimp. Palaemonetes vulgaris, in control and treated tanks after one, two or three days of predation by pinfish, Lagodon rhomboides. (Katz)
W77-06281

AVIAN BOTULISM EPIZOOTIOLOGY ON SEWAGE OXIDATION PONDS IN UTAH,
Utah Cooperative Wildlife Research Unit, Logan.
D. W. Moulton, W. I. Jensen, and J. B. Low.
Journal of Wildlife Management, Vol 40(4), p 735-742, 1976. 3 fig, 20 ref.

Descriptors: *Epizootiology, *Botulism, *Water birds, *Toxicity, *Animal diseases, Microbiology, *Public health, Mailard ducks, Aquatic animals, Microenvironment, Water quality, On-site investigations, *Utah, *Oxidation lagoons, *Sewage lagoons.
Identifiers: Anas platyrhynchos, Clostridium botulinum Type C, Avian botulism.

In the microenvironment concept of avian botulism epizootiology, it is hypothesized that invertebrate carcasses may serve as a substrate for toxin production by Clostridium botulinum type C and as a vehicle for toxin transmission to water birds. That hypothesis was field tested by attempting tto include botulism n wing-clipped mallards (Anas platyrhynchos) on sewage oxidation ponds in Utah. The experimental ponds were inoculated with C. botulinum spores in June 1974. Aquatic insect populations were monitored throughout the summer. Rotenone was used in August to kill insects in two ponds (one served as control), thereby providing potential substrate for clostridial growth and toxin production. Botulism was not detected among the birds even though they routinely ingested invertebrate carcasses. Samples of dead invertebrates contained no botulism toxin. It was concluded that the microenvironment concept, as it now stands, cannot always be a sufficient explanation of how type C botulism epizootics are initiated in nature. Other microbes may inhibit the growth of clostridial cells or destroy botulinum toxin. (Katz)
W77-06282

EFFECTS OF SOME INSECT DEVELOPMENT INHIBITORS ON MOSQUITO LARVAE,
London School of Hygiene and Tropical Medicine (England).
For primary bibliographic entry see Field 5G.
W77-06283

BEHAVIOR OF MALLARD DUCKLINGS FROM PARENTS FED 3 PPM DDE,
Fish and Wildlife Service, Laurel, Md. Patuxent Wildlife Research Center.
G. H. Heinz.
Bulletin of Environmental Contamination and Toxicology, Vol. 16(6), p. 640-645, 1976, 4 tab., 14 ref.

Descriptors: *DDE, *Water pollution effects, *Waterfowl, *Animal behavior, *Chlorinated hydrocarbon pesticides, Path of pollutants, *Mallard ducks, Laboratory tests, Animal sounds, Statistical analysis.
Identifiers: Anas platyrhynchos, *Approach responses, *Avoidance responses.

Mallard ducks fed a diet containing 3 ppm DDE (equal to about 0.6 ppm in a natural succulent diet) laid eggs that contained an average of 5.8 ppm DDE; ducklings that hatched from these eggs differed from controls in behavioral tests designed to measure responses to a maternal call and to a frightening stimulus. In response to the maternal call, ducklings from parents fed DDE were hyperresponsive; compared to controls a greater percentage approached the call and a greater percentage of those that approached remained near the call for the remainder of the test. In a test of avoidance behavior, ducklings whose parents were fed DDE traveled shorter distances from the frightening stimulus than did controls. (Katz)
W77-06284

THE EFFECT OF SUBLETHAL CONCENTRATIONS OF ZINC ON REPRODUCTION IN THE ZEBRAFISH, BRACHYDANIO RERIO HAMILTON-BUCHANAN,
New York Univ., N. Y. Lab. of Aquatic Biology.
A. W. Speranza, R. J. Seeley, V. A. Seeley, and A. Perlmutter.
Environmental Pollution, Vol. 12, p. 217-222, 1977, 2 tab., 10 ref.

Descriptors: *Metals, *Toxicity, *Zinc, *Fish physiology, Fish behavior, Lethal limit, Mode of action, Path of pollutants, Metabolism, Environmental effects, *Water quality, Laboratory tests, Bioassay, Growth stages, Water pollution effects.
Identifiers: *Zebrafish, Brachydanio rerio, Bioaccumulation, Tissue analysis, Survival rates.

Adult zebrafish, when held in water containing a threshold concentration (5 ppm) of zinc for a 9-day period in which the gametes were maturing, showed a delay in spawning. When spawning did occur, the experimental pairs of fish produced an average of 165 eggs of which only 21.1% were viable. In contrast, control pairs of fish produced an average of 434 eggs of which 90.2% were viable. In addition, survival of the eggs to hatching was significantly lower than in controls, the survival rate for the experimentals being 0.9% that of the controls, 63.3%. The adverse effects on zebrafish of exposure to zinc was reversed by returning the fish to a zinc-free environment. (Katz)
W77-06285

POLLUTANT-ASSOCIATED EMBRYONIC MORTALITY OF GREAT LAKES HERRING GULLS,
Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemicals Div.
M. Gilbertson, and G. A. Fox.
Environmental Pollution, Vol. 12, p. 211-216, 1977, 3 tab., 17 ref.

Descriptors: *Waterfowl, *Animal physiology, *Path of pollutants, *Gulls, *Chlorinated hydrocarbon pesticides, *Mode of action, *Embryonic growth stage, DDE, *Dieldrin, *Polychlorinated biphenyls, Bioindicators, Environmental effects, Water pollution, *DDT, Growth stages, Mortality, Growth rates.
Identifiers: *Herring gulls, Larus argentatus, *Bioaccumulation, Hexachlorobenzene, Tissue analysis.

The poor hatching success of Lake Ontario herring gull (Larus argentatus) appeared to be associated with reduced size, enlarged livers, porphyria and accumulations of peritoneal fluid, subcutaneous muco-serous exudates and pericardial fluid. These signs were thought to be associated with the widespread organochlorine pollutants, DDE, Dieldrin, hexachlorobenzene and PCBs, which were all tested mathematically. The herring gull appeared to be a sensitive physiological system and was suggested for use as a bioindicator for organochlorine pollutants. (Katz)
W77-06286

INFLUENCE OF THE DBS (DETERLON) AND TBS (MARLON) TYPE DETERGENTS ON THE BREAM ABRAMIS BRAMA (L.) UNDER THE APPLIED LOAD OF THE GENERAL PHYSICAL EFFORT,
Institute of Ichthyology, Szczecin (Poland). Dept. of Fish Physiology.
R. Wegrzynowicz, B. Klyszejko, G. Glebocka, and J. Muzykiewicz.
Acta Ichthyologica et Piscatoria, Vol. 5(1), p. 45-50, 1975, 1 fig., 1 tab., 11 ref.

Descriptors: *Detergents, Water pollution, *Water pollution effects, Path of pollutants, *Toxicity, Biodegradation, *Laboratory tests, Statistics, Fish physiology, Environmental effects.
Identifiers: *Bream, Abramis brama, *Ionic detergents, *Anionic detergents, *Deterlon, *Morlon, DBS, TBS.

Bream were tested for changes in adaptability to general physical effort in aquaria dosed with 1,2,3 and 4 mg of active substance of two different types of detergents per liter of water. TBS type detergent had less effect at 1 mg/1 and 2 mg/1, but at 3 mg/1 both reduced the effort adaptability to about 30% of normal. At 4 mg/1 the effort adaptability was 6.7% for DBS and 19.2% for TBS. (Katz)
W77-06287

PHYSIOLOGICAL AND BEHAVIORAL RESPONSES TO HYPOXIA AND HYDROGEN SULFIDE IN THE INFAUNAL ASTEROID CTENODISCUS CRISPATUS,
Maine Univ. at Orono. Dept. of Zoology.
J. M. Schick.
Marine Biology, Vol. 37, p. 297-289, 1976, 4 fig., 1 tab, 36 ref.

Descriptors: *Benthos, Aquatic life, *Oxygen requirement, Animal physiology, Animal behavior, *Animal pathology, *Hydrogen sulfide, *Mode of action, Sulfur compounds, Analytical techniques, Oxygen demand, Environmental effects, Laboratory tests, Respiration, Toxicity, *Marine animals, Bays, *Maine.
Identifiers: *Echinoderms, Tissue analyses, *Ctenodiscus crispatus, *Hypoxia, Asterias vulgaris, Asterias forbesi, *Belfast Bay(Maine).

Survival of Ctenodiscus crispatus during exposure to hypoxia at 5 degrees C was greater than of any echinoderm reported in the literature, the LT50 being 248 h; this was reduced to 236 h in the presensce of hydrogen sulfide. Unlike asterias vulgaris and A. forbesi, both of which lost the tube foot response to tactile stimulation long before death from hypoxia occurred, C. crispatus remained responsive until death. The extension of the highly protrusible epiproctal cone, which occurred on 75% of the mud stars simultaneously exposed to hypoxia and H2S, served to maintain burrow contact with the overlying water. The rate of oxygen consumption remained constant down to an ambient oxygen partial pressure of 10-24 mm Hg, becoming more oxygen-dependent after prior exposure of the ateroids to hypoxia. C. crispatus exhibited a clear oxygen-debt phenonenon as well as a compensatory reduction in the residual P O2 (oxygen partial pressure at which O2 consumption increased) from 2.4-0.2 mm Hg after hypoxic exposure. (Katz)
W77-06288

THE IDENTIFICATION OF PHOSPHORUS AS A GROWTH LIMITING NUTRIENT IN LOUGH NEAGH USING BIOASSAYS,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5A.
W77-06289

ON A SNAIL'S CHANCES OF BECOMING A YEAR OLD,
Washington Univ., Seattle. Dept. of Zoology.
T. M. Spight.
Oikos, Vol. 26(1), p. 9-14, 1975, 1 fig., 4 tab., 7 ref.

Descriptors: *Snails, *Juvenile growth stage,*Mortality, Marine animals, Mollusks, *Fecundity, Food abundance, Predation, Longevity, On-site data collections, Aquiculture, Animal populations.
Identifiers: Thais lamellosa, Oyster predators.

Mortality rates of juvenile Thais were obtained by comparing fecundities to size structures and to counts of juveniles. Although about 1000 eggs are produced annually by a female, rarely do 10 eggs survive to age 1. For Thais lamellosa (Gmelin) both egg and yearling crops varied by an order of magnitude over a 5-yr period. Size of yearling population was not correlated with egg production. Equally many T. lamellosa survived to age 1 in 2 adjacent populations. Numbers reaching age 1 increased annually from 1968 to 1973 in both populations and the change paralleled an increase in food abundance. 90-90% of hatchings died within 2 months of hatching, but 10-35% of survivors lived for a further 10 months. (Katz)
W77-06290

A DIURNALLY FLUCTUATING THERMAL SYSTEM FOR STUDYING THE EFFECT OF TEMPERATURE ON AQUATIC ORGANISMS,
Pennsylvania Univ., Philadelphia. Dept. of Biology.
B. W. Sweeney.
Limnology and Oceanography, Vol. 21(5), p. 758-763, 1976, 4 fig., 2 tab., 6 ref.

Descriptors: *Laboratory equipment, *Water temperature, *Diurnal, Laboratory tests, *Methodology, Benthos, *Aquatic insects, Fluctuations, Seasonal, Bioassay, Aquiculture.
Identifiers: Benthic macroinvertebrates, Developmental dynamics oscillating temperature regime.

An open, flow-through system with diurnally fluctuating temperature regimes has been designed to study growth and developmental dynamics of benthic macroinvertebrates. Animals are kept in five sets of plastic troughs and trays arranged in a longitudinal series and separated by polyethylene-lined warming pools. Five diurnally oscillating temperature regimes of various magnitudes are produced depending on pool size. The magnitudes of the temperature pulse are quite predictable for each regime. (Katz).
W77-06291

ROSEWOOD POLYPHENOLS AFTER PHENOLOXIDASE ACTIVITY FROM THE MANTLE OF THE MARINE BIVALVE MOLLUSC, MODIOLUS DEMISSUS DILLWYN,
Duke Univ., Durham, N. C. Dept. of Zoology.
J. H. Waite.
Pesticide Biochemistry and Physiology, Vol. 6, p. 239-242, 1976. 16 ref.

Descriptors: Marine animals, *Mollusks, *Bioassay, *Wood preservatives(Pesticides), Laboratory tests, Methodology, *Animal physiology, Enzymes mussels, *Wood wastes, *Phenols.
Identifiers: *Modiolus demissus, Marine wood-boring organisms, Cinnamylphenols, Shell synthesis, Marine bivalves.

Phenoloxidase from the mantle of the marine bivalve Modiolus demissus Dillwyn slowly catalyzes the oxidation of the rosewood ingredient obtusastyrene (Km 0.13 mM, Vmax 0.30 mM/min/mg). However, in the presence of another rosewood ingredient, obtusaquinone, the oxidation rate is increased to a limiting maximal velocity of 11 mM obtusastyrene /min/mg, without a concommitant change in the Km. The oxidation products of either the slow reaction or the obtusaquinone-enhanced reaction inhibit the catechol dehydrogenase function of phenol-oxidase. The phenoloxidase-modifying properties of obtusaquinone and obtusastyrene may be related to the inhibition of shell formation in wood-boring bivalve larvae settling on rosewood. (Katz)
W77-06292

FEEDING MODES AND PREY SIZE SELECTION IN THE ALEWIFE (ALOSA PSEUDOHARENGUS),
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies; and Wisconsin Univ.-Milwaukee. Dept. of Zoology.
J. Janssen.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 1972-1975, 1976, 1 fig., 1 tab., 9 ref.

Descriptors: *Zooplankton, *Fish behavior, *Feeding rates, *Fish diets, *Fish food organisms, Prey fish, Food chains, Nutrient requirements, *Predation, *Lake Michigan.
Identifiers: *Alewives, *Alosa pseudoharengus, Feeding behavior, Prey size selection.

Alewives (Alosa pseudoharengus fed on zooplankton in 3 modes: (1) particulate feeding on individual prey; (2) filtering with the mouth held agape, accompanied by strong swimming; and (3) gulping, in which the mouth opened and closed more slowly than a particulate feeder and more rapidly than a filterer and swimming was slower than in a filterer. Individuals that fed by filtering were not size selective; gulpers were size selective; and particulate feeders were more selective than gulpers. Gulpers and filters took more than one prey per mouth opening and closing; particulate feeders took only one. (Katz).
W77-06293

BIOCONCENTRATION OF XENOBIOTICS IN TROUT BILE: A PROPOSED MONITORING AID FOR SOME WATERBORNE CHEMICALS,
Medical Coll. of Wisconsin, Milwaukee. Dept. of Pharmacology.
C. N. Statham, M. J. Melancon, Jr., and J. L. Lech.
Science, Vol. 193, p. 680-681, 1976. 1 tab., 10 ref.

Descriptors: *Rainbow trout, *Salmonids, *Trout, *Fish physiology, Mode of action, Path of pollutants, Methodology, *Bioindicators, Bioassay, Radioactivity, Tracers, Analytical techniques, Laboratory tests, Water quality, *Pollutant identification.
Identifiers: *Xenobiotics, Bile, Tissue analysis, *Bioaccumulation.

A technique was proposed for the monitoring of certain xenobiotic pollutants in suspect aquatic environments by fish bile analysis. Bile removed from rainbow trout (Salmo gairdneri) exposed to nine different radioactive compounds in vivo contained concentrations of radioactivity greater than those in the surrounding water. Bile-to-water radioactivity ratios as high as 10,000:1 were found after 24-hour exposures. The results of these experiments suggested that analysis of bile of wild or caged fish from a suspect site may be useful as a qualitative monitoring aid for certain types of xenobiotics in water. (Katz)
W77-06294

SORPTION OF CADMIUM BY A POPULATION OF THE DIATOM PHAEODACTYLUM TRICORNUTUM IN CULTURE (SORPTION DU CADMIUM PAR UNE POPULATION DE LA DIATOMEE PHAEODACTYLUM TRICORNUTUM EN CULTURE),
Quebec Univ., Rimouski. Dept. of Oceanography.
D. Cossa.
Marine Biology, Vol. 34, p. 163-167, 1976. 2 fig., 2 tab., 13 ref.

Descriptors: *Cadmium, *Metals, *Diatoms, *Algae, *Metabolism, *Absorption, *Adsorption, Mode of action, Path of pollutants, Chemical reactions, Chelation, Growth stages, Laboratory test.
Identifiers: *Phaeodactylum tricornutum, Bioaccumulation, Tissue analysis.

The uptake of cadmium by the marine diatom Phaeodactylum tricornutum (Bohlin) maintained in batch culture was measured as a function of successive growth stages of the diatom, and of the chemical form of cadmium in the culture medium. The relative importance of adsorption and absorption of cadmium by the diatom was evaluated. When cadmium was chelated by ethylenediaminetetraacetate (EDTA) the uptake was negligible. In the absence of a chelating agent the uptake varied with the growth phase of the culture, and the major part of the uptake was by adsorption. Two opposite phenomena seemed to be responsible for the processes observed: adsorption of cadmium on the cell walls followed by a gradual elution (desorption) by external metabolites. (Katz)
W77-06295

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF POLLUTION BY ZINC, CADMIUM, LEAD, AND COPPER. II. RELATIONSHIP OF METALS IN THE MUSSEL TO THOSE DISCHARGED BY INDUSTRY,
Melbourne Univ., Parkville (Australia). Dept. of Zoology.
D. J. H. Phillips.
Marine Biology, Vol. 38, p. 71-80, 1976. 4 fig., 2 tab., 24 ref.

Descriptors: Effluents, Indicators, *Bioindicators, *Mussels, *Mollusks, *Gastropods, *Metals, *Industrial wastes, *Zinc, *Cadmium, *Lead, *Copper, Water pollution sources, Path of pollutants, Water quality, Monitoring, Animal physiology, Laboratory tests, Water analysis, *Australia, Bays, Waste disposal.
Identifiers: Bioaccumulation, Port Phillip Bay(Australia), Western Port Bay(Australia).

Concentrations of zinc, cadmium, lead and copper were measured in whole soft parts of the common mussel Mytilus edulis to determine its potential as a bioindicator for trace metals. M. edulis was found to be an efficient time-integrated indicator of zinc, cadmium and lead over varied environmental conditions including changes in salinity, water temperature, relative metal concentrations, and depth and season of sampling. The mussel was recommended as an alternative indicator to sediment and water analysis and was suggested for the monitoring of industrial effluents at the discharge site, allowing rapid and inexpensive water quality control. Its use as an indicator for copper was discouraged. (Katz)
W77-06296

EXPERIMENTAL VERIFICATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION ON METHYL AND BUTYL ESTERS OF METHACRYLIC ACID IN WATER BODIES, (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
N. V. Klimkina, R. S. Ekhina, and A. N. Sergeev.
Gig Sanit 4, p 6-11, 1976.

Descriptors: *Lethal limit, Pollutant identification, Toxicity, *Organic acids, Organoleptic properties, Rodents, Water pollution effects.
Identifiers: *Esters, *Methacrylic-acid, *Metacrylates.

Complex hygienic investigations were carried out to substantiate the maximum permissible concentration of methylmetacrylate (MMA) and butylmetacrylate (BMA) in water bodies. The suggested standard level of MMA is 0.1 mg/l, judging by its toxic effect on the body of warm-blooded animals (mouse, rat, rabbit, guinea pig), and that of BMA 0.02 mg/l, judging by its effect on the organoleptic properties of water, i.e., its smell.--Copyright 1976, Biological Abstracts, Inc.
W77-06299

THE EFFECT OF HYDROTECHNICAL CONSTRUCTION ON THE PARASITES OF THE DENIPER RIVER, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
A. P. Markevich, M. P. Iskov, V. P. Koval', and M. I. Chernogorenko.
Gidrobiol Zh 12(2), p 5-12, 1976.

Descriptors: *Fish parasites, Rivers, Construction, Ecosystems, *Mollusks, *Trematodes.
Identifiers: Trematodes, Ukrainian-Ssr, *USSR(Dnieper River).

Hydrotechnical construction along the Dnieper River (Ukrainian SSR,USSR) resulted in numerous hydrological, hydrochemical and hydrophysical changes. The effect of this construction on the ecosystem in general and on the parasite fauna in particular at the sites of the major reservoirs of the Dnieper series is discussed. The trematode fauna of mollusks and parasites of the ichthyofauna are given particular attention.--Copyright 1976, Biological Abstracts, Inc.
W77-06323

PRIMARY PRODUCTION OF THE PHYTOPLANKTON OF THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
D. V. Nakani, and M. N. Korsak.
Gidrobiol Zh 12(2), p 87-90, 1976.

Descriptors: *Primary productivity, Reservoirs, *Phytoplankton, Light, Cyanophyta, *Mesotrophy, Temperature.
Identifiers: Asterionella-formosa, Melosira-granulata, Melosira-italica, Microcystis-aeruginosa, Microcystis-pulverea, Pediastrum-duplex, Russian-SFSR, Scenedesmus-bijugatus, Scenedesmus-quadricauda, Stephanodiscus-hantzschii, *USSR(Uchinskoye Reservoir).

The primary production of the Uchinskoye Reservoir (Russian SFSR, USSR) phytoplankton, dominated by Asterionella formosa, Melosira italica, M. granulata, Stephanodiscus hantzschii, Microcystis aeruginosa, M. pulverea, ediastrum duplex, Scenedesmus bijugatus and S. quadricauda, was studied in June-Sept., 1973. The gross output decreased as the depth of the water decreased; this was primarily the result of lack of light rather than a decrease in temperature. Maximum production values were observed at 0.5 and 1.2 m, and 60% of the organic substances were created in the 0-3 m layer. The summer peak of production occured during the period of massive blue-green algal development in the middle of July to the beginning of Aug., when M. aeruginosa comprised 90% of the total phytoplankton quantity. The gross production for the vegetation period May-Sept. was estimated at 40 g C/m2, and the solar energy utilization coefficient was 0.007, indicating that the reservoir is mesotrophic.--Copyright 1976, Biological Abstracts, Inc.
W77-06332

IMPROVED EXTRACTION OF CHLOROPHYLL A AND B FROM ALGAE USING DIMETHYL SULFOXIDE,
Geological Survey, Doraville, Ga. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-06337

NUTRIENT BUDGETS FOR LAKE ERIE, 1970,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns.
Journal Fisheries Research Board of Canada, Vol. 33, p. 520-536, 1976. 6 fig., 9 tab., 26 ref.

Descriptors: *Nutrients, *Lake Erie, *Water quality, Depth-area-duration analysis, Chlorides, Phosphorus, Nitrogen, Silica, Cycling nutrients, Epilimnion, Equations, Water storage, Lake basins, Phytoplankton, International waters, Canada.
Identifiers: *Nutrient budgets, Central basin(Lake Erie), Western basin(Lake Erie), Eastern Basin(Lake Erie), Great Lakes Water Quality Agreement.

A simple water budget was calculated for Lake Erie in 1970, for quantities of water, chloride, and phosphorus entering and leaving the lake. Phosphorus was budgeted for three geographic lake basins and was further disaggregated into epilimnion budgets for two of the basins. Epilimnion budgets were also developed for soluble inorganic nitrogen (SIN) and soluble reactive silica (SRS). Calculations, including use of a mesolimnion exchange model, showed patterns of net material transport between lake zones, how the transports occurred, and how inputs of various nutrients might impact on loadings. It was concluded that: (1) summer sources of SRS are uncontrollable by man, and (2) nitrogen loading to the epilimnion is partially controllable, and some reduction could be achieved by limiting springtime inputs of nitrogen compounds. If phosphorus inputs to the lake are reduced to 14,600 metric tons as planned, three changes in lake water quality would possibly result: (1) the western basin and southshore waters of the central basin would show a marked improvement; (2) open and northshore waters of the central basin would show a slow improvement commencing some years after the loading reductions and continuing for many years; (3) north and south shoreline areas of the eastern basin would improve in a few years but open waters of the basin would take many years to indicate measurable change. (Auen-Wisconsin)
W77-06351

MAINE LAKE WATER QUALITY STRATEGY.
Maine Dept. of Environmental Protection, Augusta.
Maine Bureau of Water Quality Control, Div. of Lakes and Biological Studies. July 18, 1975. 70 p. 1 fig., 4 tab., 43 ref.

Descriptors: *Maine, *Lakes, *Water quality, *Eutrophication, Planning, Water pollution control, Water management(Applied), Long-term planning, Trophic level, Water quality standards, Law enforcement, Regulation, Land use, Alternative planning, Marshes, Freshwater marshes, Environmental effects, Nutrient removal, Watershed management.

Identifiers: *Cobbossee Watershed(Maine), Problem identification and ranking, Lake restoration.

Restoration of culturally-stressed lakes and the protection of unspoiled lakes are both emphasized in a study of ways in which nearly 3,000 lakes and large ponds in Maine can be protected in the future. The recommendations include but are not limited to the following: (1) Stricter enforcement of existing lake water quality roles are needed; (2) a long-term monitoring program should be established for updating trophic classification and to measure trends in trophic status; (3) land use controls should be developed to minimize nutrient and sediment additions from nonpoint sources in agriculture and forestry; (4) alternative solutions to municipal waste disposal problems should be found to avoid discharge of wastewater treatment plant effluents to lakes; (5) an annual revision of the list of 'problem' lakes in the state should be made, including an evaluation of the system of priority ranking; (6) marshed should be protected from dredging and filling through enactment of a freshwater wetlands act by the state; (7) to reduce lake phosphorus loads by 50%, all phosphorus detergents should be banned; (8) the Cobbossee Watershed District might be used as a pilot for development of future watershed districts. Other recommendations deal with public participation and the need for greater levels of intergovernmental cooperation. (Harris-Wisconsin)
W77-06357

A PHOSPHORUS BUDGET FOR LAKE ERIE,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, J. D. H. Williams, J. M. Jaquet, A. L. W. Kemp, and D. C. L. Lam.
Journal Fisheries Research Board of Canada, Vol. 33, p. 564-573, 1976. 2 fig., 9 tab., 16 ref.

Descriptors: *Lake Erie, *Phosphorus, Water quality, Depth-area-duration analysis, Cycling nutrients, Lake basins, International waters, Canada, Input-output analysis.
Identifiers: *Phosphorus budgets, Central basin(Lake Erie), Western basin(Lake Erie), Eastern basin(Lake Erie), Great Lakes Water Quality Agreement.

A budget for retention of apatite phosphorus (AP) and nonapatite phosphorus (NAP) was calculated for the western, central and eastern basins of Lake Erie by two independent methods, which agreed within 9.5% of their mean for the total phosphorus retention within the entire lake. Estimates of AP retention within the western basin also agreed well. However, the input-output balance estimates of AP retention in the central basin and of NAP retention in the western and central basins greatly exceeded the corresponding sedimentation values, while in the eastern basin this pattern was reversed. The AP discrepancy was attributed to unobserved transport of AP from the central to the eastern basin via nearshore currents past Long Point, while NAP discrepancies were largely attributed to its eastward movement through the lake within about 2 meters of the lake bottom. The division of the total phosphorus budgets for the two different forms was necessary because apatite does not enter the phosphorus cycle. The total amount of phosphorus retained within the lake in 1970 was 41,000 metric tons, or about 92% of input. AP of natural origin and inert nature accounted for approximately 44% of the total phosphorus retained. A reduction in anthropogenic phosphorus input of about 15,000 metric tons/year would reduce the present annual phosphorus loading to approximate the pre-1850 values. (V.S. Auen-Wisconsin).
W77-06365

POLICY REGARDING THE USE OF COPPER COMPOUNDS AS AQUATIC HERBICIDES IN MAINE.
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
For primary bibliographic entry see Field 5G.
W77-06366

PCB INVESTIGATIONS OF THE MISSISSIPPI RIVER AND ITS TRIBUTARIES WATER, BOTTOM SEDIMENT AND POINT SOURCES,
Minnesota Pollution Control Agency, Minneapolis. Surface and Groundwaters Section.
M. E. Hora.
November 1975. 23 p. 3 fig., 6 tab., 1 append.

Descriptors: *Polychlorinated biphenyls, *Mississippi River, *Bottom sediments, *Water pollution sources, *Tributaries, Aroclors, Minnesota, Fish, Dredging, Wisconsin, Pesticide residues, Industrial wastes, Effluents.

The Mississippi River from Monticello, Minnesota to Alma, Wisconsin and selected tributaries were sampled in summer 1975 to estimate the extent of polychlorinated biphenyl (PCB) contamination. Five river water stations showed PCB concentrations ranging from 0.04 to 10 ppb. The Crow, Minnesota, Vermillion, Cannon Rivers and Hay Creek showed no PCB concentrations above the detection limit in the sediments; the Rum and ST. Croix Rivers showed concentrations ranging from 40 to 70 ppb at their confluence with the Mississippi River. Higher fish flesh PCB concentations appeared to correspond to higher PCB levels in the sediments. Only two wastewater treatment plant effluents showed PCB levels above 0.40 ppb, while the other 31 plant effluents had no detectable levels. Of 61 industrial discharges sampled, only one had a PCB concentration above the 0.40 ppb detection limit. Dredging activities were thought to be a PCB source, as water samples above and below a dredging site contained undetectable levels, the spoil runoff sampple contained a PCB concentration of 0.5 ppb. Araclor 1254 was the most commonly identified PCB in water samples (49%) and sediments (54%). Aroclors 1221, 1242 and 1248 represented 18%, 18% and 13%, respectively. Bottom sediments were a good indicator of PCB pollution. (Auen-Wisconsin)
W77-06368

PROPOSED TROPHIC CLASSIFICATION OF THE GREAT PONDS OF MAINE,
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
J. Bailey.
Draft Report, October 1975. 26 p. 2 fig, 3 tab, 20 ref.

Descriptors: *Trophic level, *Classification, *Lakes, *Ponds, *Maine, *Water quality standards, Baseline studies, Water management(Applied), Eutrophication, Impoundments.
Identifiers: Trophic state index, *Trophic classification.

A classification system designed as a management tool to control eutrophication is proposed for Maine's Great Ponds--defined as natural bodies of water larger than 10 acres and altered bodies of water and impoundments larger than 30 acres with two or more owners enjoying shoreline property rights. The purpose of the system is to determine the existing water quality of the Great Ponds, to determine what activities affect water quality and to predict the consequences of different land uses. The proposed index is to be expressed on a numerical scale of 0 to 100, with the lowest designation indicating the highest water quality as reflected by Secchi disk measurements (in meters), surface phosphorus concentrations (in mg/cu m), and surface chlorophyll (in mg/cu m). Water quality management strategies are to include elimination of point phosphorus sources and estimates of phosphorus loading from non-point sources based on land use patterns. Future water quality changes are predicted using a simple model that relates water quality phosphorus loading, and the individual assimilation capacity of each Great Pond. Capacity is determined by measuring hydraulic retention time and average depth. The model is useful in evaluating specific development proposals or sewage abatement programs. (Auen-Wisconsin)
W77-06372

STANDARD PROCEDURES FOR BIOLOGICAL EVALUATION.
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
For primary bibliographic entry see Field 5A.
W77-06374

THE PRODUCTION OF MARINE ORGANISMS UNDER NATURAL CONDITIONS AND IN CULTURES (IN GERMAN),
Kiel Univ. (West Germany).
P. H. Koske, J. Lenz, W. Nellen, and B. Zeitzschel.
Bundesministerium fur Forschung und Technologie, April 1975. 99 p. 8 fig, 14 tab, 235 ref. Report M 75-01.

Descriptors: *Food chains, *Aquaculture, *Marine organisms, *Productivity, Phytoplankton, Zooplankton, Fish food organisms, Cultures, Pollutants, Food pyramids, Oceans, Organic compounds, Toxicity.
Identifiers: Bioaccumulation.

The production efficiency achieved thus far in the field of marine aquaculture is compared with productivity under natural conditions in the oceans. The major ecological factors limiting natural productivity are pointed out and the problems and potentialities of aquaculture on various levels of the food chain are discussed. Attention is mainly focused on unicellular algae as primary procedures, herbivorous zooplankton as secondary producers, and the final products--mussels, fish and shrimps, which rely on both of these food levels. The fourth chapter is devoted to the general laws governing growth of cultured organisms as demonstrated by phytoplankton algae, the group most intensively studied so far. A brief discussion deals with the biaccumulation of toxic substances. (Auen-Wisconsin).
W77-06375

EFFECTS OF LEACHED MIREX ON EXPERIMENTAL COMMUNITIES OF ESTUARINE ANIMALS,
Environmental Research Lab., Gulf Breeze, Fla.
M. E. Tagatz, P. W. Borthwick, J. M. Ivey, and J. Knight.
Archives of Environmental Contamination and Toxicology, Vol 4, No 4, p 435-442, 1976. 4 tab, 11 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Toxicity, *Shellfish, *Insecticides, *Mortality, Southeast US, Runoff, Baits, Fish, Pink shrimp, Crabs, Mussels, Oysters, Minnows, Bottom sediments, Estuaries.
Identifiers: *Bioaccumulation, *Mirex, Grass shrimp, Mud crabs, Hermit crabs, Ribbed mussels, American oysters, Sheepshead minnows.

A study demonstrated that mirex, a chlorinated hydrocarbon insecticide applied in bait form to control imported fire ants in the southeastern United States, can be leached from the bait by fresh water and that it can be concentrated by and affect survival of members in an experimental estuarine community. The ten-week investigation used leached mirex mixed with salt water to yield concentrations averaging 0.038 microgram/l. Mortality of grass shrimp (Palaemonetes vulgaris), pink shrimp (Penaeus duorarum), common mud crabs (Panopeus herbstii) and striped hermit crabs (Clibanarius cittatus) was significantly higher in

tanks containing mirex. Mortality of ribbed mussels (Modiolus demissus) and American oysters (Crassostera virginica) was significantly lower in treated tanks, probably because the numbers of both crab species, which ate the bivalves, were reduced. Sheepshead minnows (Cyprinodon variegatus) were least affected by mirex. Almost all deaths occurred after 10 or more days of exposure. All exposed animals accumulated mirex, with maximum concentrations ranging from 5500X in pink shrimp to 73,700X in soft tissues of oysters, above the concentration in the water. The sand substratum contained this chlorinated hydrocarbon insecticide up to 1500X that in the water. (Auen-Wisconsin).
W77-06376

THE INFLUENCE OF DAYLENGTH, LIGHT INTENSITY AND TEMPERATURE ON THE GROWTH RATES OF PLANKTONIC BLUE-GREEN ALGAE,
Northern Ireland Dept. of Agriculture, Antrim; and Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
R. H. Foy, C. E. Gibson, and R. V. Smith.
British Phycological Journal, Vol 2, p 151-163, 1976. 6 fig, 6 tab, 18 ref.

Descriptors: *Cyanophyta, *Growth rates, *Light intensity, *Photoperiodism, Anabaena, Water temperature, Foreign research, *Eutrophication.
Identifiers: *Lough Neagh(Ireland), Aphanizomenon flos-aquae, Oscillatoria agardhii, Oscillatoria redekei, Anabaena flos-aquae.

The unexpected finding that growth rates of the four dominant blue-green alga in Lough Neagh, Ireland, when corrected for an equivalent photoperiod, were markedly faster than those obtained from laboratory culture studies under a continuous light regime, was investigated by culturing the species under a range of temperature and light-dark conditions. The in vitro growth rates under continuous light of Anabena flos-aquae, Aphanizomenon flos-aquae, Oscillatoria aghardii and O. redekei, were slower than in situ rates, when corrected for hours of light. However, by culturing on a 6:18 light-dark cycle in vitro growth rates were obtained that were similar to the in situ rates. Under continuous light small species showed the fastest growth, with O. redekei the dominant species. But this pattern was almost completely reversed under the light-dark cycle with 0. redekei only exhibiting the fastest growth rate under low light conditions. This observation agreed with Lough Neagh field data whch showed that 0. redekei reached its maximum crop in April while the other three species were dominant during summer. Compared to the generally-assumed high thermal requirements of blue-green algae the temperature maxima of the four species were low; no growth was observed at 35C for any species while Anabaena flos-aquae was severely inhibited at 25C. (Auen-Wisconsin)
W77-06377

HISTORY OF THE PHOSPHATE DETERGENT BAN IN INDIANA,
Manchester Coll., North Manchester, Ind.
For primary bibliographic entry see Field 5G.
W77-06378

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
Rensselaer Polytechnic Inst., Troy, N. Y.
D. Scavia, and R. A. Park.
Ecological Modelling, Vol 2, p 33-58, 1976. 10 fig, 6 tab, 58 ref. (Rensellaer Fresh Water Institute Report FWI 75-9, 1975; IBP Contribution 235). NSF AG-199, BMS69-01147. A09, EPA 68-03-2142.

Descriptors: Computer models, *Lakes, *Equations, *Mathematical models, *Computer programs, Phytoplankton, Zooplankton, Cycling nutrients, Photosynthesis, Light intensity, Water temperature, Productivity, Grazing, Biomass, Predation, Respiration, Growth rates, Mortality, Phosphorus, Nitrogen, Microbial degradation, Documentation.
Identifiers: *Computer model CLEAN, *Computer model CLEANER, Lake George(NY), Lake Wingra(Wis).

The mathematical aquatic model CLEAN, based on detailed studies at Lake Wingra, Wisconsin, and Lake George, New York, has been improved with incorporation of phosphorus and nitrogen cycling, addition of compartments for blue-green algae and dissolved oxygen, reformulation of the decomposition submodels, and refinement of various process terms. A routine has also been included to transform biomass values into environmental-perception characteristics such as predicted secchi disk readings, fish catch, algal ratios, and concentrations of noxious algae. Mathematical constructs (process representations) critical to the phytoplankton and zooplankton submodels in the revised CLEANER model are described and the parameterizations of the phytoplankton, zooplankton, and nutrient submodels are documented, and their simulated behavior through a typical year are illustrated. The time-course relations of the processes controlling the state variables of the model, including phytoplankton, zooplankton (cladocerans), and nutrient dynamics of reactive orthophosphate and nitrogen cycling are modeled and the basis for the submodels is discussed. (Auen-Wisconsin).
W77-06381

COMPARISON OF BENTHIC DIATOM COMMUNITIES IN LAKE MICHIGAN AND LAKE SUPERIOR,
E. F. Stoermer.
Verhandlungen Internationale Vereinigung Limnologie, Vol 19, Part II, p 932-938, 1975. 7 tab, 16 ref. EPA R-803037-1.

Descriptors: *Diatoms, *Distribution, *Lake Michigan, *Lake Superior, *Benthic flora, Water pollution effects, Varieties, Dominant organisms, Benthos, Lakes.
Identifiers: Baccilariophyta.

Results based on a limited number of samples indicate that both the calculated diversity and absolute richness of Benthic Diatom Flora increase as sampling proceeds northward from stations in southern Lake Michigan to the northern part of the lake and into Lake Superior. Diatoms at selected stations in Lake Michigan and one locality in Lake Superior were sampled at varying depths to determine whether anthropogenetic disturbances affect their diversity and abundance. The shallowest stations contained the highest numbers of taxa and the highest diversity but while the numerical values were depressed at the very deep stations, the diversity values were higher due to the equitable distribution of species abundance. The highest average diversity, both in taxa present and calculated diversity value was found in mid-depth stations but the numbers and diversity were smaller in southern Lake Michigan than those in the northern portion of the lake. The average number of taxa in Lake Superior samples was larger than for stations in northern Lake Michigan although the average diversity value was somewhat depressed. Most of the species found in Lake Michigan were also present in Lake Superior; however many Lake Superior species did not occur in Lake Michigan samples. It is believed that the difference are due to the varying degrees of cultural disturbances imposed on the different study areas. (Auen-Wisconsin)
W77-06384

A PRELIMINARY ACCOUNT OF SOME LAKES AT DIFFERENT ALTITUDES IN SOUTHWEST NEW ZEALAND,
V. M. Stout.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1452-1460, 1975. 3 fig., 5 tab., 6 ref.

Descriptors: *Lakes, *Water quality, *Chemical properties, *Physical properties, *Varieties, Specific conductivity, Hydrogen ion concentration, Alkalinity, Chlorides, Calcium, Magnesium, Sodium, Potassium, Silica, Nitrogen, Phosphorus, Iron, Chlorophyll, Biological communities, Foreign countries, Eutrophication, *Oligotrophy.
Identifiers: *New Zealand, South Island(New Zealand), Lake Eyles(New Zealand), Lake Orbell(New Zealand), Lake Monk(New Zealand), Lake Mike(New Zealand), Lake Te Au(New Zealand), Lake Mouat(New Zealand), Lake Marchant(New Zealand).

Physical and chemical characteristics and biological communities of seven oligotrophic lakes in the Fiordland National Park on South Island, New Zealand, are described, giving altitude, maximum depth, minimum temperature, secchi disc readings, and degree of stratification. All the lakes had very low conductivity and pH values; oxygen vales were generally high, with the lowest oxygen saturation at 60%. Alkalnity, as calcium carbonate, varied from 2.5 to 20.0 g/cu m; chlorides and nitrate were often undetectble. Soluble phophorus was never detectable (above 0.002 g/cu m). Calcium was the dominant cation and sodium levels ranged from 0.6 to 3.0 g/cu m. Potassium ranged from 0.09 to 0.38 g/cu m, and the silica measurements were in the range of 0.5 to 2.8 g/cu m. Chlorophyll-a content was generally low. The dominant zooplankton was the calanoid copepod Boeckella dilatata, with other zooplankton species listed in the order of dominance. Several rotifer species dominated the lakes, with variations dependent on altitude. (Auen-Wisconsin).
W77-06385

ESTIMATING DAILY RATES OF EXTRACELLULAR DISSOLVED ORGANIC CARBON RELEASE BY PHYTOPLANKTON POPULATIONS,
T. A. Storch, and G. W. Saunders.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 952-958, 1975. 5 fig., 12 ref.

Descriptors: *Phytoplankton, *Carbon cycle, *Measurement, *Metabolism, Carbon, Carbon radioisotopes, Photosynthesis, Proteins, Lakes, *Michigan.
Identifiers: *Dissolved organic carbon, *Frains Lake(Mich).

A procedure and rationale are given for quantification of the maximum amount of dissolved organic carbon given off through extracellular release by phytoplankton, on the assumption that DOC is released solely from the protein pool. Is it probable that either high molecular weight substances are derived from a pool smaller than the total protein pool or that DOC is simultaneously released both from small intermediary pools at isotopic equilibrium and from metabolic pools not at isotopic equilibrium. The method for calculating specific activity of the protein pool is detailed and essentially involves measuring the radioactivity and the carbon-12 content of the intracellular protein pool. The exact intracellular pools producting the extracellular DOC and the Specific amounts originating from each pool depends on the algal species, the algal growth stage, and the chemical and physical parameters which influence metabolism. It appears that phytoplankton generally release higher molecular weight organic substances rather than simple sugars, amino acids and other simple substances. If this is true, ten phytoplankton extracellular release has been understimated and accurate estimates cannot be made until the extracellular products are chemically identified and the size of the metabolic pools is determined. (Auen-Wisconsin)
W77-06386

LAKE TRUMMEN RESTORATION PROJECT. I. WATER AND SEDIMENT CHEMISTRY,
For primary bibliographic entry see Field 5G.
W77-06387

LAKE TRUMMEN RESTORATION PROJECT. II. BACTERIA, PHYTOPLANKTON AND PHYTOPLANKTON PRODUCTIVITY,
For primary bibliographic entry see Field 5G.
W77-06388

LAKE TRUMMEN RESTORATION PROJECT. III. ZOOPLANKTON, MACROBENTHOS AND FISH,
For primary bibliographic entry see Field 5G.
W77-06389

PRIMARY PRODUCTIVITY, PHYTOPLANKTON POPULATIONS AND NUTRIENT BIOASSAYS IN CHINA LAKE, MAINE, U.S.A.,
D. L. Thurlow, R. B. Davis, and D. R. Sasseville.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1029-1036, 1975. 5 fig., 3 tab., 12 ref.

Descriptors: *Maine, *Primary productivity, *Nutrients, *Phytoplankton, *Bioassay, Sampling, Seasonal, Succession.
Identifiers: *China Lake(Maine).

A report is made on data collected over 13 months in China Lake, Maine during 1972-73, concentrating on the relationships between nutrients and phytoplankton populations and principal components underlying seasonal succession of these populations. Phytoplankton counts were made, and bioassays were conducted on 20 of 26 sampling dates. According to results, correlations of cell numbers and cell volume with other community properties differed. Responses to nutrient additions in four-hour carbon-14 bioassays and in one to three-week chlorophyll bioassays both differed markedly by season and were maximal in early summer for all nutrients tested. The trace elements iron, manganese and molybdenum elicited responses throughout the year, while the major elements phosphorus, nitrogen and silicon elicited responses primarily during periods of high standing crop, community constancy, and favorable light and temperature. Principal component analyses of the phytoplankton data depicted seasonal changes in community composition and together with the bioassay results revealed a complex, shifting spectrum of nutrient effects on the phytoplankton assemblages. (Harris-Wisconsin)
W77-06390

NON-BIOLOGICAL FACTORS AFFECTING PHOSPHATE RECYCLING IN THE WATER OF A TROPICAL EUTROPHIC LAKE,
A. B. Viner.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, Part II, p. 1404-1415, 1975. 6 fig., 2 tab., 29 ref.

Descriptors: *Tropical regions, *Lakes, *Phosphates, *Cycling nutrients, Iron, Calcium, Acidity, Alkalinity, Eutrophication, Africa.
Identifiers: *Lake George(Uganda), *Phosphate recycling.

It has been previously demonstrated that supplies of inorganic phosphate have considerable importance in controlling the metabolism of Lake George (Uganda), a shallow tropical body of water. Field observations were made to isolate factors which might influence this phosphate concentration. Sampling along transects showed possible phosphate correlations with the amount of dissolved organic material and with iron. Laboratory experiments, in which calcium and iron concentrations, acidity/alkalinity and dissolved organic material were altered, showed some influence of all these factors upon the phosphate concentrations. Calcium was most influential, but only at high acidity, suggesting the presence of some hydroxyapatite co-precipitation. Analysis of the superficial mud supported this suggestion. The very high amount of organic material present may have been too great to inhibit phosphate precipitation and possibly enhanced it instead. Transitory high acidity during maximum photosynthesis could inhibit the phosphate species available to the algae. (Harris-Wisconsin)
W77-06391

THE EFFICIENCY OF PHOTOSYNTHETIC LIGHT ENERGY UTILIZATION BY LAKE PHYTOPLANKTON,
M. M. Tilzer, C. R. Goldman, and E. de. Amezaga.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 800-807, 1975. 4 fig., 1 tab., 23 ref. NSF-RANN GI-22.

Descriptors: *Lakes, *Photosynthesis, Limnology, *Eutrophication, *Tropic level, Phytoplankton, Primary productivity, *Energy conversion, *Light penetration, Plant pigments, Attenuation, Biomass, Foreign research.
Identifiers: *Photosynthetic efficiency, Lake Chad(Africa), Lake Wingra(Wis), Lake Sammamish(Wash), Loch Leven(Scotland), Lake Tahoe(Calif and Nev), Castle Lake(Calif), Clear Lake(Calif), Vorderer Finstertaler Sea(Austria).

Eight lakes of different trophic state and latitude were compared for degree of overall photosynthetic efficiency as measured by annual means as well as seasonal fluctuations. The study utilized data collected by different investigators in tropical Lake Chad (Africa), highly productive lakes Wingra and Sammamish (U.S.), shallow and very productive Loch Leven (Scotland) and Clear Lake (U.S.), less productive and transparent subalpine Lake Tahoe and Castle Lake (U.S.), and alpine Vorderer Finstertaler See (Austria). The latter two have thick, light-absorbing ice covers in winter. Efficiencies range from 0.035 to 3% and are mainly controlled by events in the upper layers where light energy inputs are high. Biomass concentrations per unit volume have the greatest effects on efficiency by influencing the percentage of total light which is absorbed by photosynthetic pigments. In oligotrophic lakes photosynthesis per unit of biomass is controlled by both abiotic and biotic factors and governs the seasonal efficiency fluctuation, while in densely populated lakes biomass changes are most important. In extremely turbid lakes, as well as in transparent lakes with extremely low populations, efficiency fluctuations are controlled by variations of total light attenuations, since limitation by plant light attenuation is most pronounced here. (Harris-Wisconsin)
W77-06393

DISTINCTIONS IN ALGAL ECOLOGY AND PRODUCTION IN TWO LINKED UPLAND LAKES, GWYNEDD, N. WALES,
C. M. Happey-Wood.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 1045-1056, 1975. 15 fig., 1 tab., 13 ref.

Descriptors: *Algae, *Lakes, *Lake morphometry, *Primary productivity, Contours, Limnology, Phytoplankton, Glaciation, Thermal stratification, Foreign research, Dissolved oxygen, Water chemistry, Photosynthesis, Tourism.
Identifiers: *Llyn Padarn(N Wales), *Llyn Peris(N Wales).

Llyn Peris and Llyn Padarn, although joined by a single stream, comprise differing lake ecosystems, a fact about the upland Welsh lakes most clearly demonstrated by the phytoplankton algae and their in situ photosynthetic rates. However, from more rigorous study, these original distinctions appear more suitable than was originally apparent from slight differences in lake morphometry, stability of thermal stratification, dissolved oxygen levels or certain features of the water chemistry. Differentiation in physicochemical characteristics may be attributed to the shape of the glacial valley and lake basins together with the differing biological activity within the lakes and population influences on the already-richer, lower lake of the system--Padarn. Llyn Peris is nutrient poor, with a small and patchy phytoplankton population of low productivity. In contrast, Llyn Padarn is richer in nutrients, algae and primary production. Phytoplankters in Llyn utilize incident radiation more efficiently than those in Llyn Padarn. (Harris-Wisconsin)
W77-06394

EFFECTS OF ZOOPLANKTON GRAZING ON NUISANCE ALGAL BLOOMS,
South Dakota State Univ., Brookings. Dept. of Botany and Biology.
L. Haertel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 664, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, March 1977. 68 p, 5 fig, 12 tab, 27 ref, 2 append. OWRT A-047-SDAK(1), 14-34-0001-5042.

Descriptors: *Eutrophication, Zooplankton, Phytoplankton, *Algae, Grazing, Food webs, *Food chains, Lakes, *Standing crops, Bioassay, Regression analysis, Correlation analysis, Cyanophyta, Diatoms, Chlorophyta, Chrysophyta.
Identifiers: *Zooplankton(Grazing), Lucustrine food chains, *Prairie lakes.

The effect of zooplankton grazing on the populations of common algal species was investigated by three different methods in four prairie lakes. In the first method, the change in standing crop of algae over a two-day period was measured by 16 in situ experiments in using three different concentrations of grazing zooplankton in large polyethylene containers. The second method involved analyzing the gut contents of 289 zooplankters. The third method involved correlation and regression analysis of the changes in standing crop of algae species relative to chemical and physical changes and changes in the standing crop of zooplankton species over the same two-year period that the experiments were being run. Agreement between all three different methods of analysis suggests that at least five common species of bloom-forming bluegreen algae, Anacystis incerta, A. cyanea, Aphanizomenon holsatica, Anabaena spp. and Gomphosphaeria spp. are sometimes grazed by the zooplankton. At least two species of diatoms, Fragilaria crotonensis, and Melosira spp., are also indicated by all three methods of analysis to be grazed. Other species which are probably occasionally grazed, but which are not sufficiently abundant to be tested by all three methods include the bluegreen, Coccochloris peniocystis, the diatoms, Cyclotella spp., Stephanodiscus astrea and Asterionella formosa, the greens, Oocystis spp. and Spondylomorum sp., and the chrysophyte, Dinobryon sp. Some of the species listed are enhanced by the grazing interaction, but more are depleted. (Wiersma-So Dak State)
W77-06398

LONG-TERM EFFECTS OF LEAD EXPOSURE ON THREE GENERATIONS OF BROOK TROUT (SALVELINUS FONTINALIS),
Environmental Research Lab.-Duluth, Minn.
G. W. Holcombe, D. A. Benoit, E. N. Leonard, and J. M. McKim.
Journal of the Fisheries Research Board of Canada, Vol 33, p 1731-1741, 1976. 5 fig, 3 tab, 26 ref.

Descriptors: *Salmonids, *Brook trout, *Trout, *Metals, *Lead, *Fish physiology, *Growth stages, Growth rates, Toxicity, Metabolism, Absorption, Path of pollutants, Mode of action, Bioassay, Analytical techniques, *Lethal limit,

Mortality, Environmental effects, Laboratory tests.
Identifiers: *Bioaccumulation, *Scoliosis, *Tissue analysis, *Fish morphology, Spinal deformities, Longterm bioassays.

Exposure of three generations of brook trout (Salvelinus fontinalis) to mean total lead concentrations (0.9-474 microgram/1) showed that all second-generationn trout exposed to 235 and 474 microgram/1 Pb and 34% of those exposed to 119 microgram Pb/1 liter developed severe spinal deformities (scoliosis). Scoliosis also appeared in 21% of the newly hatched third-generation alevins exposed to 119 microgram Pb/liter, and weights of these fish 12 wk after hatch were significantly reduced. Gill, liver, and kidney tissues of first- and second-generation brook trout accumulated the greatest amount of lead. Only small amounts accumulated in the edible muscle. An equilibrium of lead residues was reached in liver and kidney tissue from second-generation fish after 70 wk of exposure, but not in gill tissue. Fish exposed to 119 microgram Pb/liter and then placed in uncontaminated control water for 12 wk showed a 70, 78, and 74% loss in micrograms Pb per gram for gill, liver, and kidney tissue, respectively, and a 39, 56, and 35% loss, respectively, in the total micrograms of Pb in the whole tissue. Residue analysis of eggs, alevins, and juveniles showed that lead was accumulated during these life stages. The maximum acceptable toxicant concentration (MATC) for brook trout in water with a hardness of 44 mg/liter (as CaCO3) and a pH of 6.8-7.6 lies between 58 and 119 microgram liter for total lead and between 39 and 84 microgram/liter for dissolved lead. The MATC was based on the development of scoliosis in second and third-generation fish and the reduced growth of 12-wk-old third-generation trout. The 96-h LC50 for brook trout was 4100 microgram/liter based on total lead and 3362 microgram/liter based on dissolved lead; and therefore, the application factor (MATC/96-h LC50) lies between 0.012 and 0.029 for both total and dissolved lead. (Katz)
W77-06401

TOXIC EFFECTS OF CADMIUM ON THREE GENERATIONS OF BROOK TROUT (SALVELINUS FONTINALIS),
Environmental Research Lab.-Duluth, Minn.
D. A. Benoit, E. N. Leonard, G. M. Christensen, and J. T. Fiandt.
Transactions of the American Fisheries Society, Vol 105, No 4, p 550-560, 1976. 3 fig, 2 tab, 25 ref.

Descriptors: *Metals, *Cadmium, *Salmonids, *Trout, *Brook trout, *Fish physiology, *Toxicity, Fish behavior, Metabolism, Absorption, Mode of action, Path of pollutants, Bioassay, Water quality, Analytical techniques, Laboratory tests.
Identifiers: Bioaccumulation, Tissue analysis, Retardation.

Three generations of brook trout (Salvelinus fontinalis) were exposed to several concentrations of total cadmium (0.06-6.4 microgram Cd/Liter). Significant numbers of first- and second-generation adult males died during spawning at 3.4 microgram Cd/liter. This concentration also significantly retarded growth of juvenile second- and third-generation offspring. The maximum acceptable toxicant concentration (MATC) for brook trout exposed to cadmium in Lake Superior water (hardness 44 mg/liter as CaCO3, pH 7-8) lies between 1.7 and 3.4 microgram Cd/liter. Cadmium-residue analyses of kidney, liver, gill, gonad, spleen, muscle, and red blood cells from first- and second-generation trout indicated that kidney, liver, and gill tissue accumulated the greatest amounts of cadmium at each water exposure concentration. No signigicant increases in cadmium were measured in edible muscle at any of the cadmium water concentrations testes. Cadmium residues in kidney, liver, and gill tissue of fish from all exposure concentrations reached equilibrium (microgram Cd/g tissue) in both first- and second-generation trout after 20 weeks. Cadmium loss from gill tissue of second-generation trout placed in control water for 12 weeks was rapid; however, no loss was detectable from the liver and kidney. (Katz)
W77-06402

THE QUANTITATIVE CYTOCHEMICAL EFFECTS OF THREE METAL IONS ON A LYSOSOMAL HYDROLASE OF A HYDROID,
Institute for Marine Environmental Research, Plymouth (England).
N. M. Moore, and A. R. D. Stebbing.
Journal of the Marine Biological Association of the United Kingdom, Vol 56, No 4, p 1007-1028, 1976. 3 fig, 2 tab, 22 ref, 1 plate.

Descriptors: Invertebrates, *Growth rates, *Enzymes, *Metals, *Cadmium, *Copper, *Mercury, *Toxicity, Lethal limit, Animal physiology, Mode of action, Path of pollutants, Metabolism, Absorption, Biochemistry, Analytical techniques, Laboratory tests, Marine animals, Cytological studies, *Bioassay.
Identifiers: *Hydra, *Campanularia flexuosa, Bioaccumulation, *Lysosomes, Tissue analysis, *Acetyl-glucosaminidase.

The quantitative effects of Cu2+, Cd2+ and Hg2+ on the cyto-chemical staining reaction for lysosomal acetyl glucosaminidase were determined and related to the inhibitory effect of the metals on colonial growth rate in the experimentally cultured hydroid Campanularia flexuosa. Cytochemical threshold concentrations were comparable to known environmental levels and were about one order of magnitude lower than those obtained by measuring growth rates. Pretreatment of colonies with Cu2+ gave no indication of tolerance adaptation, although evidence exists for the accumulative toxicity of Cu2+ and the possible sequestration of the metal in endodermal cell lysosomes. Cu2+ may exert its toxic effect by decreasing the stability of the lysosomal membranes, thus increasing the level of free glucosaminidase activity. (Katz)
W77-06403

THE ACCUMULATION OF MERCURY IN FISHES REARED IN THE SEA WATER CONTAMINATED BY SUSPENDED SOLIDS CONTAINING MERCURY, (IN JAPANESE),
Environmental Research Center, Inc., Yokohama (Japan).
R. Tarao, T. Tabata, and M. Yasuhara.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42(12), p 1411-1422, 1976. 6 fig, 8 tab, 13 ref.

Descriptors: *Mercury, *Mud, *Commercial fish, Heavy metals, Water pollution effects, Path of pollutants, Toxicity, Sediments, Marine fish, *Public health, Laboratory tests, Bioassay.
Identifiers: *Japan(Minamata Bay), Red Sea Bream, Chrysophrys major, Mejina, Girella punctata, Marbled rock fish, Sebasticus marmoratus, Insoluble compounds, Methylmercury.

Red sea bream (Chrysophrys major), mejina (Girella punctata) and marbled rock fish (Sebasticus marmoratus) were reared in three kinds of sea water suspending the muds of Minamata Bay, with total mercury concentration levels of 600 and 100 ppm (dry base), and a reference mud 0.1 ppm Hg (dry base). The mercury in the muds was mainly in insoluble compounds. The rearing time and the increase in total and methyl mercury concentrations (T-Hg and M-Hg) of these fishes were traced. Very small increases of T-Hg and M-Hg were observed and the equilibrium values were low (maximum value for T-Hg: 0.278 ppm - in mejina, for M-Hg: 0.144 ppm - in marbled rock fish). Fishes were reared in aerated sea water irradiated by U.V. light resulting in y00 values of 0.315 ppm (T-Hg) and 0.171 ppm (M-Hg). (Katz)
W77-06404

INFLUENCE OF ENVIRONMENTAL FACTORS ON SELENIUM FLUX IN TWO MARINE INVERTEBRATES,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, and G. Benayoun.
Marine Biology, Vol 37, p 59-68, 1976. 8 fig, 23 ref.

Descriptors: *Mussels, *Shrimp, *Absorption, Commercial shellfish, Environment, Water temperature, Mercury, Water pollution, Water pollution effects, Path of pollutants, Toxicity, Laboratory tests, Bioassay, Biochemistry.
Identifiers: *Selenium, Se +4, Se +6, Bioaccumulation, Environmental factors, Excretion, Mytilus galloprovincialis, Lysmata seticaudata.

The influence of environmental factors on the flux of selenium has been studied, using Mytilus galloprovincialis and Lysmata seticaudata. Bio-accumulation of selenium by mussels was strongly dependent on its concentration in sea water, temperature and mussel size. Mussels accumulated Se (+4) to a much greater extent than Se (+6). Mercury did not significantly alter selenium uptake. Shrimp accumulated less selenium due to the large amount lost with molts. Once incorporated, selenium was lost more rapidly from shrimp than from mussels. Temperature influenced selenium loss from mussels but not in shrimp. Neither the chemical form of selenium nor mercury concentration in the organism affected loss of selenium from mussels. Elimination of selenium from shrimp was more rapid when absorbed directly from the water than via the food chain. In general, long-term selenium turnover rates were quite similar for both species; biological half-times ranged from 58 to 60 days for shrimp and 63 to 81 days for mussels. (Katz)
W77-06405

EFFECTS OF SAND SEDIMENTATION ON COLONIZATION OF STREAM INSECTS,
Idaho Univ., Moscow. Dept. of Entomology.
R. J. Luedtke, and M. A. Brusven.
Journal of the Fisheries Research Board of Canada, Vol 33(a), p 1881-1886, 1976. 5 tab, 12 ref.

Descriptors: *Aquatic insects, *Benthos, *Sedimentation, Sedimentation rates, Ecological distribution, Mining, Mine drainage, On-site data collection, Laboratory tests, Tagging, Streamflow, Flow rates, Sands, Stoneflies, Caddisflies, Diptera, Mayflies, Idaho.
Identifiers: Insect colonization, Basket samplers, Drift nets, Riffle insects, *Sand sedimentation, Emerald Creek(Idaho).

Driftnets, basket samplers, and artificial streams were used to investigate the influence of heavy sand accumulation on insect drift, colonization, and upstream movements in Emerald Creek, northern Idaho. Most riffle insects successfully passed through low-velocity, sandy reaches 80 m long. Upstream movements on sand were impeded by flows as low as 12 cm/s, except for the heavily caused caddisfly Dicosmoeccus sp. (Katz)
W77-06407

DISTRIBUTION AND ISOLATION OF RADIOACTIVITY FROM 74AS-ARSENATE AND 14C-METHANEARSONIC ACID IN AN AQUATIC MODEL ECOSYSTEM,
Agricultural Research Service, Beltsville, Md.
E. A. Woolson, A. R. Isenee, and P. C. Kearney.
Pesticide Biochemistry and Physiology, Vol 6, p 261-269, 1976. 7 tab, 19 ref.

Descriptors: *Arsenic compounds, *Carbon radioisotopes, *Adsorption, Laboratory tests, *Bioassay, Biochemistry, Arsenic radioisotopes, Radiochemical analysis, Aquatic algae, Freshwater fish, Daphnia, Crayfish, Gas chromatography, Methodology, *Algae, *Crustaceans, Freshwater fish, *Crayfish, *Daphnia, Catfishes.
Identifiers: Bioaccumulation ratios, Radioactive arsenate, Model ecosystems.

A model aquatic ecosystem was used to measure the bioaccumulation and distribution of 74As-arsenate and 14C-methanearsonic acid in the following aquatic organisms: algae, Oedogonium cardiacum; daphnids, Daphnia magna; fish, Gambusia affins and catfish, Ictalurus punctatus; and crayfish, Procambarus clarkii, Bioaccumulation ratios (BR) for 74As ranged from 80 to 480 and 4 to 7, for crayfish, and catfish, respectively, in Experiment I. Bioaccumulation ratios were 5, 127, 34, and 5 for daphnids, Gambusia, algae, and crayfish in Experiment II. Values declined for both crayfish and catfish after they were removed to untreated water. The cold acid extracts of algae, daphnids, and crayfish contained the highest levels of 74As. Generally, 14C was distributed more uniformly among the four fractions and was found at a higher percentage in the residue than was arsenate. By gel filtration chromatography, several compounds were separated from extracts of algae, daphnids, Gambusia and Crayfish treated with 74As. (Katz)
W77-06408

RESPONSE OF PROTOZOAN COMMUNITIES EXPOSED TO CHLORINE STRESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. Cairns, Jr., and J. L. Plafkin.
Archiv fur Protistenkunde, Vol 117, p 47-53, 1975. 5 fig, 1 tab, 7 ref.

Descriptors: *Chlorine, *Chlorination, *Ecological distribution, *Protozoa, Density, Speciation, Water quality, Environmental effects, Water properties, Water pollution sources, Ecosystems, Succession, Productivity, Biological communities, Effluents, Analytical techniques, *Toxicity.
Identifiers: *Chlorine stress, *Species diversity, Tolerance.

Protozoan communities inhabiting polyurethane substrates suspended in Douglas Lake, Michigan were transferred into glass jars and exposed to various concentrations of free chlorine. These communities were then examined to determine which species surived exposure. Communities exposed to free chlorine three times in a two hour period exhibited a significant decrease in number of species (relative to controls) at concentrations above 1.15 ppm. Free chlorine concentrations above 0.66 ppm administered every 20 minutes over the two hours produced significant decreases in number of species. Community diversity, determined by the WILHM and DORRIS diversity index (d) was also significantly reduced by three exposures to concentrations above 1.15 ppm. Exposure every 20 minutes produced significant reductions in diversity at five of the seven exposure concentrations between 0.58 ppm and 2.85 ppm. Certain species appeared more tolerant of chlorine stress than others. Individuals of these species constituted a larger percentage of the communities' total numbers as chlorine stress increased. Preliminary results indicate that increased frequency of exposure lowers the concentration which produces a significant reduction in diversity. (Katz)
W77-06409

ZOOPLANKTON POPULATIONS IN A POLLUTED, TROPICAL EMBAYMENT,
Puerto Rico Nuclear Center, Rio Piedras. Radioecology Div.
M. J. Youngbluth.
Estuarine and Coastal Marine Science, Vol. 4, p. 481-496, 1976. 5 fig., 7 tab., 35 ref.

Descriptors: *Zooplankton, *Plankton, Population, Aquatic populations, *Distribution patterns, *Copepods, Fossil fuels, Water pollution sources, Density, Productivity, Growth rates, Heated water, Powerplants, Bays, Environmental effects, Growth stages, Speciation, *Puerto Rico.
Identifiers: Acartia tonsa, *Barnacles, Balanus amphitrite, *Guayanilla Bay(PR).

During 1973-74 biweekly collections of zooplankton were made at three sites in Guayanilla Bay, Puerto Rico: the intake and receiving waters of a fossil-fueled power plant and in the entrance to the bay. The zooplankton ranged from 74 to 5407 organisms/cubicmeter. Densities increased two-to-eight fold several times during the study. The largest variations were associated with seasonal wind and rainfall patterns and reflect the short generation times of the dominant species, the copepod Acartia tonsa and the naupliar larvae of the barnacle Balanus amphitrite. Water movements and thermal pollution accounted for regional differences in density and species composition. Zooplankton were more abundant and diverse at the entrance to the embayment where bay and coastal waters mix. Smaller concentrations and numbers of species characterized the assemblages in the shallower intake waters. Consistently lower densities, fewer species and sporadic increase in abundance characterized the zooplankton found in the thermal cove. (Katz)
W77-06410

TEMPERATURE SELECTION OF JUVENILE ATLANTIC SALMON (SALMO SALAR) AS INFLUENCED BY VARIOUS TOXIC SUBSTANCES,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
R. N. Peterson.
Journal of Fisheries Research Board of Canada, Vol. 33, p. 1722-1730, 1976, 3 fig., 3 tab., 26 ref.

Descriptors: *Juvenile fish, *Water temperature, *Chemical wastes, *Toxicity, Salmonids, *Atlantic salmon, Fish physiology, Water pollution effects, Laboratory tests, Heavy metals, Pesticide toxicity, Pesticides, *Copper, *Zinc, *Cadmium, Juvenile fish.
Identifiers: *LC50, Temperature selection, Pentachloro-pnenati, Gulhion, Malathion, Dursban, Dibrom, Lindane, Sevin, Hepatchlor, Fenitrothion, Preferred temperature.

Previous exposure to sodium pentachlorophenate (NaPCP), Guthion(R), malathion, Durshan(R), and Dibrom(R) lowered the preferred temperature for juvenile Atlantic salmon (Salmo salar) tested in a horizontal temperature gradient. Lindane, CuSO4, ZnSO4, CdSO4, Sevin(R), heptachlor, and fenitrothion did not change the preferred temperature significantly. Comparison with other published results indicates that those substances that increase the preferred temperature are more toxic (based on relevant changes in 24-h LC50) at low temperatures and vice versa. It is suggested that such shifts in selected temperature may be of potential immediate short-term survival value to the fish. (Katz)
W77-06411

TOXICITY OF THE HERBICIDES DINOSEB AND PICLORAM TO CUTTHROAT (SALMO CLARKI) AND LAKE TROUT (SALVELINUS NAMAYCUSH),
Fish and Wildlife Service, Jackson, Wyo. Fish-Pesticide Research Lab.
D. F. Woodward.
Journal of the Fisheries Research Board of Canada, Vol. 33, p. 1671-1676, 1976, 5 tab., 21 ref.

Descriptors: *Herbicides, *Toxicity, *Cutthroat trout, *Lake trout, *Juvenile fish, Persistence, Water pollution effects, Mortality, Salmonids, Hydrogen ion concentration, Hardness(Water), Growth rate, Bioassay, Water temperature.
Identifiers: LC50, Salmo clarkii, Salvelinus namaycush, *Dinoseb.

In static tests of the toxicity of two herbicides, dinoseb (2,4-dinitro-6-sec-butylphenol) and picloram (4-amino-3,5,6-trichloropicolinic acid), to cutthroat and lake trout, the 96-h LC50's ranged from 32 to 1400 micrograms per liter for dinoseb and from 2050 to 8600 micrograms per liter for picloram. Decreasing pH from 8.5 to 6.5 increased the toxicity of dinoseb by a factor of 43 and decreased that of picloram by a factor of 0.5. Generally, toxicity increased with increasing water temperature. Sensitivity of both species of fish increased with water hardness in tests of dinoseb but was not affected by water hardness in tests of picloram. The toxicity of both chemicals was not changed by aging in water for up to 4 wk or by exposing the fish longer than 96-h. Rate of yolk sac absorption and growth of lake trout fry was reduced in flow-through tests at concentrations as low as 0.5 micrograms per liter dinoseb or 35 micrograms per liter picloram. Chronic toxicity of both compounds on early life stages of lake trout is more significant than might be anticipated on the basis of only acute tests with fingerlings. (Katz)
W77-06412

RESISTANCE OF ADULT SOCKEYE SALMON TO ACUTE THERMAL SHOCK,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
J. A. Servizi, and J. O. T. Jensen.
Progress Report Number 34, 11 p., 1977. 1 fig., 3 tab., 10 ref.

Descriptors: *Sockeye salmon, *Water temperature, *Fish diseases, *Mortality, Salmon, *Thermal stress, Thermal pollution, Water pollution effects, Laboratory tests, Fish management, Bioassay.
Identifiers: *Flexibacter columnaris, Early run sockeye salmon, Geometric Mean Survival Time(GMST).

The resistance of adult sockeye salmon (Oncorhynchus nerka) to acute thermal shock was measured under laboratory conditions using sockeye treated to resist infection. A graph of geometric mean survival time (GMST) versus temperature was similar to that reported for juvenile sockeye but was displaced lower by 1 to 1.5C, indicating that adults were less resistant to high temperatures. A discontinuity occurred at the upper end of the curve where a second mortality curve commenced associated with infections of Flexibacter columnaris. Loss of equilibrium preceded death, with the difference in time between first loss of equilibrium and GMST decreasing as temperature increased. It was concluded that mortalities could be expected for thermal exposures exceeding the temperature-time relations for the loss-of-equilibrium curve. However, since temperatures lower than those causing death by thermal shock are a factor in mortalities caused by F. columnaris, it was recommended that these lower levels take precedence when temperatures are specified for protection of sockeye. (Katz)
W77-06413

THE EFFECTS OF CHELATING AGENTS ON THE UPTAKE AND ACCUMULATION OF CADMIUM BY MYTILUS EDULIS,
Institute of Marine Biochemistry, Aberdeen (Scotland).
S. G. George, and T. L. Coombs.
Marine Biology, Vol. 39, p. 261-268, 1977. 7 fig., 19 ref.

Descriptors: *Mussels, *Cadmium, *Absorption, Heavy metals, Water pollution effects, Path of pollutants, Radioisotopes, Bioassay, Biochemistry, *Animal physiology, Toxicity, Mortality, Commercial shellfish.
Identifiers: *Chemical complexing, Thionein, Bioaccumulation, Excretion, *Detoxification, Tissue samples.

The uptake, storage and excretion of cadmium by the common mussel Mytilus edulis (L.) has been studied at sub-lethal concentrations using the

radioactive isotope 115mCd as a marker. After an initial lag period, the uptake at low concentrations in sea water is linear with time and directly proportional to the sea water concentration, with a maximum concentration factor of 165 at 0.7 micrograms Cd per milliliter sea water. A decrease occurs at higher concentrations indicating saturation of the available binding capacity. Prior complexation of the cadmium with either EDTA, humic and alginic acids or pectin doubles both the rate of accumulation and the final tissue concentrations (order: kidney >> viscera > gills >> mantle > muscle) and eliminates the lag period, suggesting that ionic cadmium must first be complexed before uptake can occur. A mechanism for this effect, which may involve thionein, is described. The rate of excretion of cadmium is 18 times slower than that of uptake, with the major route via the kidney but not via the byssal threads as with particulate iron. The need to detoxify and store cadmium by an immobilization mechanism is a consequence of this slower rate of elimination. (Katz)
W77-06414

ECOLOGICAL AND NUTRITIONAL STUDIES ON DINOBRYON EHRENB.: SEASONAL PERIODICITY AND THE PHOSPHATE TOXICITY PROBLEMS,
Washington Univ., Seattle. Dept. of Zoology.
J. T. Lehman.
Limnology and Oceanography, Vol. 21(5), p. 646-658, 1976, 13 fig., 1 tab., 27 ref.

Descriptors: *Chrysophyta, *Phosphates, *Potassium compounds, *Toxicity, Adsorption, Growth rates, Competition, Grazing, Nutrient requirements, Chemical analysis, Laboratory tests, On-site investigations, Seasonal, Distribution patterns, *Absorption, Nutrients, Food chains.
Identifiers: *Dinobryon, Uptake rates.

Although field studies show inverse correlations between concentrations of dissolved phosphate and abundances of Dinobryon, phosphorous is not toxic even at high concentrations. Species abundance in water of low phosphate concentration may be traced instead to effective mechanisms for phosphate uptake which allow the cells to thrive at low ambient levels of PO4-P. Half saturation constants of less than 0.5 micromoles PO4-P can be demonstrated both in laboratory cultures and in situ in lakes. Ambient concentrations of potassium ion can be toxic to a variety of species of Dinobryon and thus can limit both the geographical and seasonal occurrence. Ammonium serves as a better nitrogen source than does nitrate, an observation supported by both field and laboratory data. At least one species, Dinobryon sertularia, is physiologically limited to water temperatures below 20C. (Katz)
W77-06415

EFFECT OF SODIUM CHLORIDE ON BLOOD LACTATE AND PH OF CHANNEL CATFISH DURING RECOVERY FROM HYPOXIA,
Southern Illinois Univ., Carbondale. Fisheries Research Lab.
W. L. Kirk.
The Progressive Fish-Culturist, vol. 38, no. 1, p. 48-50, 1976. 4 tab, 17 ref.

Descriptors: *Channel catfish, *Fish diseases, *Sodium chloride, *Salts, *Fish physiology, Hydrogen ion concentration, Metabolism, Mode of action, Excretion, Absorption, Water quality, Water pollution effects, Biochemistry, Fresh water fish, Laboratory tests.
Identifiers: *Blood lactate, *Hypoxia, *Ictalurus punctatus.

The addition of sodium chloride to the water in which channel catfish (Ictalurus punctatus) were recovering from acidosis induced by acute hypoxia did not significantly alter the state of return of blood lactate and pH to pre-stress levels. Blood pH returned to control levels more rapidly at higher temperatures and appeared to precede the return of lactate. During early stages of recovery, lactate levels of catfish in salt solution were higher, rather than lower, than the levels of fish in fresh water. Data which indicated an increased rate of urinary excretion of lactate and hydrogen ions after hypoxia suggested that the kidney was the primary site of elimination of the acid end product of hypoxia. (Katz)
W77-06416

MOVEMENT OF RAINBOW TROUT ACROSS A METALIMNION DEFICIENT IN DISSOLVED OXYGEN,
Wisconsin Dept. of Natural Resources, Madison. Water Resources Research Section.
S. L. Serns.
The Progressive Fish-Culturist, vol. 38, no. 1, p. 54, 1976. 1 fig.

Descriptors: *Trout, *Rainbow trout, *Dissolved oxygen, *Dissolved oxygen analyzers, Fish behavior, Oxygen, Salmonids, Water quality, Environmental effects, Design, Research and development, Equipment, Lakes.
Identifiers: *Metalimnion.

To determine whether cold-water fish would move through a low dissolved oxygen barrier in a metalimnion, a lake was stocked with 1,000 rainbow trout (Salmo gairdneri). The adipose fin was removed from 500 fish before they were released in a hypolimnion aerator by placing them in the aerator air-water separator box and allowing them to be flushed down the return tubes. After 15 min no trout were left in the separator box; the remaining 500 trout (unmarked) were released at the lake surface. Three unmarked trout and four marked trout were captured near the surface, indicating that the low dissolved oxygen concentrations in the metalimnion did not restrict movement through this zone. (Katz)
W77-06417

COMPARISON OF STOMACH CONTENTS AND CONDITIONS OF TWO CATFISH SPECIES LIVING AT AMBIENT TEMPERATURES AND IN A HEATED DISCHARGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5A.
W77-06418

USE OF THE ASIATIC CLAM, CORBICULA LEANA PRIME, IN TOXICITY TESTS,
Fish and Wildlife Service, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W77-06423

2,4-D REDUCES SAPROLEGNIA ON FATHEAD MINNOW EGGS,
Fish and Wildlife Service, Columbia, Mo. Fish-Pesticide Research Lab.
F. L. Mayer.
The Progressive Fish-Culturist, Vol. 38, No. 1, p. 19, 1976. 1 fig.

Descriptors: *Fish diseases, *Pathogenic fungi, *Minnows, *Growth stages, *Fish eggs, Aquiculture, *Pesticides, *2,4-D toxicity, Path of pollutants, Laboratory tests, Methodology.
Identifiers: *Pimephales promelas, *Saprolegnia.

A reduced incidence of Saprolegnia infestations was noted on eggs from fathead minnows (Pimephales promelas) exposed to the dimethylamine salt of 2.4-D (2,4-D DMA) during a study of the chemicals' chronic toxicity. The degree of infestation was inversely related to the exposure concentration of 2,4-D DMA. (Katz)
W77-06425

ENVIRONMENTAL STABILITY AND FISH COMMUNITY DIVERSITY,
Everglades National Park, Homestead, Fla.
J. A. Kushlan.
Ecology, Vol. 57(4), p. 821-825, 1976, 4 fig., 1 tab., 14 ref.

Descriptors: *Marshes, *Biological communities, *Water level fluctuations, Wetlands, *Marsh managements, Aquatic habitats, Dominant organisms, Succession, Predation, *Florida, Fish populations, Biomass, On-site data collections, Environmental effects.
Identifiers: *Everglades(Florida), *Environmental stability, Diversity, Omnivorous fish, Carnivorous fish.

Seasonal fluctuation of water level is the most critical environmental factor affecting the fish community of the Everglades marshes. During a 27-mo period of water level stability, fish density decreased but biomass, average size of fish, species richness, and species diversity increased. These changes were accompanied by a functional shift from the dominance of small sized omnivorous species to the dominace of larger sized carnivorous fish. The changes resulted from immigration of large canivorous species poorly adapted for survival in fluctuating marshes. Increased predation assumed the determining role in restructuring the community under environmentally stable conditions. The fish community of Everglades marshes oscillates between opposing tendencies of species domination, which depend on the degree of water level stability. (Katz)
W77-06426

DEVELOPMENT AND EVALUATION OF ON-SITE TOXICITY TEST PROCEDURES FOR FISHERY INVESTIGATIONS,
Southeastern Fish Control Lab. Fish and Wildlife Service, Warm Springs, Ga.
For primary bibliographic entry see Field 5A.
W77-06428

THE USE OF WARMED WATER TO ACCELERATE THE PRODUCTION OF COHO SALMON,
Washington Univ., Seattle. Coll. of Fisheries.
L. R. Donaldson, and E. I. Brannon.
Fisheries, Vol. 1, No. 4, p. 12-16, 1976, 2 fig, 3 tab, 8 ref.

Descriptors: *Salmonids, *Salmon, *Growth rates, *Growth stages, *Heated water, *Fish hatcheries, Fish reproduction, Fish handling facilities, Fish populations, Fish migration, Life cycles, Life history studies, Water quality, *Aquiculture, Anadromous fish.
Identifiers: *Coho salmon.

During the past 10 years, a program of accelerating the growth of coho salmon (Oncorhynchus kisutch) was evolved. Using improved diets and warmed water the growth of young coho into fingerling migrants required 6 months instead of the 18 months usually required in hatchery operations. Most of the accelerated smolts returned from the sea after 18 months, or at 2 years of age, as normal adults, with the number increasing over the years from 0.39% (1971) ocean survival to more than 6.0% (1975). (Katz)
W77-06429

RECORDING BIOELECTRIC ACTION POTENTIALS OF MARINE DECAPOD CRUSTACEA BY REMOTE ELECTRODES: A BIOASSAY PROCEDURE FOR MONITORING HYDROCARBON POLLUTION,
Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.
For primary bibliographic entry see Field 5A.
W77-06430

A STUDY ON THE INTENSIVE CARP CULTURE IN THE ARTIFICIALLY AERATED POND, (IN JAPANESE),
For primary bibliographic entry see Field 8I.
W77-06431

BIOLOGIC HALF-LIFE OF ENDRIN IN CHANNEL CATFISH TISSUE,
Fish and Wildlife Service, Marion, Ala. Southeastern Fish Cultural Lab.
G. A. Jackson.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 505-507, 1976. 1 fig, 1 tab, 3 ref.

Descriptors: *Bioassay, *Absorption, *Channel catfish, *Path of pollutants, *Public health, *Pesticides, Persistence, *Endrin, *Commercial fish, Laboratory tests, Chlorinated hydrocarbon pesticides, Insecticides, Pollutant identification.
Identifiers: *Tissue analysis, Bioaccumulation, *Biologic half-life.

Channel catfish (Ictalurus punctatus) were fed endrin-contaminated diets at 3 percent body weight per day and were analyzed to determine the uptake and elimination rates of the various tissues. After 147 days on the endrin-contaminated diet, average residue levels were 0.49 (whole body), 0.19 (liver), 1.53 (kidney), 1.09 (gastrointestinal tract, swim bladder not included), and 0.63 micrograms/gr (remaining carcass). After 44 days on a non-contaminated diet, endrin was reduced to non-detectable levels in the kidney and liver. The gastrointestinal tract, remaining carcass, and whole fish samples retained 0.05, 0.04, and 0.03 micrograms/gr, respectively. (Katz)
W77-06432

DURATION OF A DDT-INDUCED SHIFT IN THE SELECTED TEMPERATURE OF ATLANTIC SALMON (SALMO SALAR),
University of Western Ontario, London. Dept. of Zoology.
D. M. Ogilvie, and D. L. Miller.
Bulletin of Environmental Contamination, and Toxicology, Vol 16, No 1, p 86-89, 1976. 1 fig, 8 ref.

Descriptors: *Temperature, *DDT, *Atlantic salmon, *Chlorinated hydrocarbon pesticides, *Thermocline, Water pollution effects, *Fish behavior, Environment, Analytical techniques, Laboratory tests.
Identifiers: *Sublethal effects, Selected temperature.

Thermogradient response of fish can be altered by a variety of chemical compounds, but the persistence of these effects it not well known. Underyearling Atlantic Salmon (Salmo salar) were xposed to 50 ppb of DDT for 24 hours and then tested in a multichannel thermogradient device with control fish. Control salmon had a mean selected temperature of 19.1 C whereas test fish had a mean selected temperature of 23.4 C. This DDT-induced elvation in selected temperature persisted for a least one month. At six and seven weeks there was no longer a difference between the mean temperatures preferred by the DDT-exposed and the control fish. More work is necessary to test the hypothesis which relates the rate of DDT elimination in the salmon to changes in its level of selected temperature. (Katz)
W77-06433

INFLUENCE OF TURBIDITY ON SURVIVAL, GROWTH, AND DISTRIBUTION OF LARVAL LAKE HERRING (COREGONUS ARTEDII),
Wisconsin Univ., Superior. Dept. of Biology; and Wisconsin Univ., Superior. Center for Lake Superior Environmental Studies.
W. A. Swenson, and M. L. Matson.
Transactions of the American Fisheries Society, Vol 4, p 541-545, 1976. 2 fig, 2 tab, 14 ref.

Descriptors: *Herrings, Water quality, *Turbidity, Aquatic environment, *Growth rates, *Growth stages, Larvae, Fish physiology, *Larval growth stage, Distribution patterns, Mortality, Environmental effects, Fish behavior, Bioassay, Suspension, *Lake Superior.
Identifiers: *Lake Herring, Coregonus artedii, Survival rates.

Influence of red-clay turbidity on survival, growth, and distribution of larval lake herring, Coregonus artedii, was measured by holding larvae for 2 days at 9 levels of suspended solids varying from 0 to 48 FTU (1 to 28 ppm). Test concentrations included the normal turbidity range of the red-clay area in western Lake Superior. The bioassay was conducted in a continuous-flow system using chambers designed to elicit normal behavioral responses to turbidity and light. Growth and survival were not influenced at the range of concentrations studied. Larvae in the higher suspensions were distributed closer to the surface of the test chambers, a condition which may indirectly influence survival in Lake Superior. (Katz)
W77-06434

LEAD AND FRESHWATER FISHES: PART 1-LEAD ACCUMULATION AND WATER PH,
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
M. Merlani, and G. Pozzi.
Environmental Pollution, Vol 12, p 167-172, 1977. 3 tab, 16 ref.

Descriptors: *Metals, *Radioisotopes, *Lead, *Sunfishes, *Hydrogen ion concentration, Path of pollutants, Fish physiology, Mode of action, Bioassay, Water quality, Analytical techniques, Laboratory tests, Freshwater fish, Pollutant identification.
Identifiers: Lepomis gibbosus, *Bioaccumulation, Tissue analysis.

The accumulation of lead by the sunfish, Lepomis gibbosus was investigated at pH 7.5 and pH 6.0. At the lower pH the fish concentrated almost three times more lead than at the higher pH. The sites of lead concentration, however, were not altered by the change in water pH. The initial major sites for lead accumulation were the fins, gills and liver. Muscle tissue concentrated the least amount of lead. (Katz)
W77-06435

OSMOTIC STRESS AND MORTALITY IN ADULT AMERICAN SHAD DURING TRANSFER FROM SALTWATER TO FRESHWATER,
McGill Univ., Montreal (Quebec). Dept. of Biology.
W. C. Leggett, and R. N. O'Boyle.
Journal of Fish Biology, Vol 8, p 459-469, 1976. 5 fig, 2 tab, 16 ref.

Descriptors: *Anadromous fish, *Fish migration, *Fish behavior, *Osmotic pressure, Seawater, Freshwater, Mortality, Salinity, Biochemistry, Fish physiology, Tagging, On-site investigations.
Identifiers: *American shad, Alosa sapidissima, *Osmotic stress, Blood samples, Saltwater-freshwater interface, *Spring migration, *Blood chemistry.

Thirty-five adult American shad (Alosa sapidissima) were moved quickly (2-5 h) from saltwater to freshwater. Changes in the levels of osmotically active blood constituents and of mortality were observed during and after the transfer. These were compared with levels of corresponding constituents and of mortality in 20 shad maintained in saltwater under similar conditions and to 44 shad sampled immediately after capture in saltwater and in freshwater (40 km from the saltwater-freshwater interface). Sodium and chloride levels in the blood of the transferred group declined sharply during and after transfer. Calcium, glucose and lactic acid levels increased, and potassium and magnesium levels remained stable. Transferred shad experienced heavy mortality beginning 5 h after the initial reduction in salinity associated with movement into freshwater. No mortality was experienced in the group held in saltwater. It was concluded that the extensive meandering exhibited by adult shad at the upper limit of the salt-freshwater interface during their spring migration in the Connecticut River is a behavioural response designed to slow the transition from the saltwater to the freshwater environment, thereby minimizing the physiological stress involved and/or allowing full recovery from this stress before proceeding upriver. (Katz)
W77-06436

CHLORELLA CULTIVATION IN SLUDGE EXTRACTS,
Chinese Univ. of Hong Kong. Dept. of Biology.
M.-H. Wong, S.-W. Yip, and K.-Y. Fan.
Environmental Pollution, Vol 12, p 205-207, 1977. 1 fig, 2 tab, 12 ref.

Descriptors: *Algae, *Chlorophyta, *Cultivation, *Sludge, Sludge wastes, Growth rates, Sludge treatment, Metabolism, Environmental effects, Nutrients, *Sewage, Sewage disposal.
Identifiers: *Chlorella pyrenoidosa, *Culture media.

Sludge extracts were used as culture media for Chlorella pyrenoidosa in the laboratory. The growth rates and the chlorophyll contents of Chlorella cultivated on sludge extracts (1%, 2% and 3%) were higher than those obtained from the Kuhl medium which was recommended for vigorously growing organisms of the Chlorella type. (Katz)
W77-06437

PREFERRED TEMPERATURE OF FISH: A NEW METHOD,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering; and Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-06438

COMPARATIVE CHARACTERISTICS OF ZOOPLANKTON OF LAKE GLUBOKOYE FOR 1972-1973 AND IN 1951, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
For primary bibliographic entry see Field 2H.
W77-06455

MERCURY IN WATERFOWL FROM EASTERN CANADA,
New Brunswick Fish and Wildlife Branch, Fredericton.
For primary bibliographic entry see Field 5A.
W77-06463

EFFECTS OF SALINITY ON LARVAL GROWTH IN THE CALIFORNIA KILLIFISH, FUNDULUS PARVIPINNIS GIRARD,
California Univ., Irvine. Dept. of Population and Environmental Biology.
T. R. Rao.
California Fish and Game, Vol 63, No 1, p 22-28, 1977. 3 fig, 20 ref.

Descriptors: *Salinity, *Growth rates, *Larvae, *Salinity, *Growth stages, *Killifishes, *Fish physiology, Path of pollutants, Mode of action, Water quality, Environmental effects, Metabolism, Laboratory tests, Salt tolerance, *Larval growth stage.
Identifiers: *California killifish, *Fundulus parvipinnis.

California killifish, (Fundulus parvipinnis) larvae, incubated and hatched in salinities of 5, 14, 33, and 55%, were reared for 10 weeks in their respective incubation salinities. Larvae and juveniles were fed live Artemia nauplii once daily (ad libitum). Length, wet weight, and dry weight of randomly sampled larvae were determined at 15-day intervals. Growth rates of the larvae were highest in 55 and lowest in 5% S. It is suggested that the observed difference in growth rates were related to the probable influence of salinity on food intake and conversion efficiency of the larvae. (Katz)
W77-06464

THE STATUS OF BROWN PELICANS AT ANACAPA ISLAND IN 1975,
Fish and Wildlife Service, Davis, Calif.
D. W. Anderson, R. M. Jurek, and J. O. Keith.
California Fish and Game, Vol. 63, No. 1, p. 4-10, 197~ 1 fig, 29 ref.

Descriptors: *Birds, *Wildlife, *Chlorinated hydrocarbon pesticides, *Path of pollutants, *DDT, *DDE, *Polychlorinated biphenyls, *Animal physiology, *Mode of action, *Reproduction, *Fertility, Growth rates, Environmental effects, California, *Pesticide residues.
Identifiers: *California brown pelicans, *Pelicans, Tissue analysis, Bioaccumulation, Pelicanus occidentalis californicus, Anacapa Island(Calif), Santa Cruz(Calif).

Data of 1975 on productivity, chemical residues and egg shell thickness of California brown pelicans at Anacapa Island and nearby Santa Cruz suggested that the colonies were recovering from DDT-related reproductive failures. Although improved productivity reported through 1974 continued through 1975, productivity, residues of DDT, and eggshell thickness in 1975 were not significantly different from those of 1974, suggesting that the rate of improvement had begun to level off. Pelican productivity was still too low for population stability. Chemicals other than DDT were discussed. PCBs were also found at levels of concern in brown pelican eggs. (Katz)
W77-06465

SURVIVAL RATE AND OXYGEN CONSUMPTION OF JUVENILE WILD CARP MAINTAINED UNDER DIFFERENT CONDITIONS,
T. A. Askerov.
Hydrobiological Journal, Vol. 11, No. 3, p. 67-68, 1975. 1 tab., 1 ref.

Descriptors: *Carp, *Juvenile fish fry, *Oxygen requirements, Fish physiology, Fish hatcheries, Salinity, Water temperature, Environmental effects, Laboratory tests.

A series of experiments were conducted on wild carp (Cyprinus carpio) larvae and fingerlings to determine survival and oxygen consumption at different salinities and temperatures. Larvae need more oxygen (1.58 mg/l) and lower salinity (4o/oo) than fingerlings (1.14-0.80 mg O2/l and 6o/oo salinity). A water temperature of 27C was preferred by 38 day old fingerlings. (Katz)
W77-06467

DIELDRIN-INDUCED DESTRUCTION OF MARINE ALGAL CELLS WITH CONCOMITANT DECREASE IN SIZE OF SURVIVORS AND THEIR PROGENY,
State Univ. of New York at Stony Brook, Marine Sciences Research Center.
C. D. Powers, R. G. Rowland, and C. F. Wurster.
Environmental Pollution, Vol. 12, p. 17-25, 1977. 4 fig., 27 ref.

Descriptors: *Dinoflagellates, *Algae, *Plankton, *Phytoplankton, *Dieldrin, *Chlorinated hydrocarbon pesticides, *Toxicity, *Metabolism, Growth rates, Plant physiology, Plant morphology, Inhibition, Life cycles, Path of pollutants, Mode of action, Environmental effects, Life history studies, Bioassay.
Identifiers: *Exuviella baltica, Bioaccumulation, Tissue analysis.

Treatment of axenic cultures of the marine dinoflagellate Exuviella baltica with 10 parts per thousand million (10 to the 9th power) of dieldrin inhibited growth rate and caused large numbers of cells to disintegrate within 12 h of exposure. The diameters of surviving cells averaged 11.2% smaller than controls, this size reduction persisted for at least four generations after cells were transferred to dieldrin-free medium. These effects of dieldrin contrasted with that of DDE, which merely inhibited growth rate. Pollutant-induced cell disintegration, size reduction and growth inhibition among sensitive phytoplankters in natural waters could affect those consumers that feed selectively according to algal species and particle size. (Katz)
W77-06468

TOTAL MERCURY RESIDUES IN LIVERS AND EGGS OF OLDSQUAWS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
S. R. Peterson, and R. S. Ellarson.
Journal of Wildlife Management, Vol. 40, No. 4, p. 704-709, 1976. 1 fig., 2 tab., 28 ref.

Descriptors: *Waterfowl, *Ducks, *Oldsquaw duck, *Mercury, *Metals, *Animal physiology, Toxicity, Path of pollutants, Bioassay, Laboratory tests, Pesticides, *Lake Michigan, Canada, Lakes, Bays.
Identifiers: *Bioaccumulation, *Tissue analysis, *Oldsquaws, Clanqula hyemalis, *Hudson Bay.

Total mercury was determined in 99 oldsquaw (Clanqula hyemalis) livers and 11 composite clutches collected on Lake Michigan and in northwest Hudson Bay. Residue levels were similar in different sex and age-classes collected during the same time period on Lake Michigan. Mercury levels were higher in oldsquaws collected in Hudson Bay than in those taken on Lake Michigan. Residues in the hen and clutch were positively correlated. Mercury in duckling livers was negatively correlated with the weight of the liver. (Katz)
W77-06471

DDT AS AN ACCELERATOR OF LIMB REGENERATION AND MOLTING IN FIDDLER CRABS,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
J. S. Weis, and L. H. Mantel.
Estuarine and Coastal Marine Science, Vol. 4, p. 461-466, 1976. 2 tab, 25 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *Crabs, *Crustaceans, *Mode of action, Animal physiology, Absorption bioassay, Path of pollutants, Growth stages, Laboratory tests, Analytical techniques, Invertebrates.
Identifiers: *Fiddler crabs, *Uca pugilator, *Uca pugnax, *Limb regeneration, Bioaccumulation, Tissue analysis.

Regeneration in the fiddler crabs, Uca pugilator and Uca pugnax, was studied after single and multiple autotomy of limbs and exposure to DDT at 10 and 25 parts/10 to the 9th power. DDT accelerated the rate of limb regeneration and, in the case of animals with multiple autotomy, shortened the time to ecdysis as well. These responses may be a result of heightened excitation of the nervous system produced by DDT and the resulting secretion of neuroendocrine factors promoting limb regeneration and molting. Savin, malathion, and parathion had no effects on regeneration or molting. (Katz)
W77-06472

EFFECT OF VARYING OXYGEN CONCENTRATIONS ON THE FILTERING RATE OF DAPHNIA PULEX,
Kansas State Board of Health, Topeka. Div. of Environmental Health.
R. L. Kring, and W. J. O'Brien.
Ecology, Vol. 57, No. 4, p. 808-814, 1976. 6 fig., 33 ref.

Descriptors: *Daphnia, *Dissolved oxygen, *Feeding rates, Aquatic animals, Zooplankton, Oxygen requirements, Animal physiology, Carbon radioisotopes, Laboratory tests, Predation, Respiration, *Adaptation.
Identifiers: Daphnia pulex, *Filtering rate, Hemoglobin, Acclimation(Fish).

Knowledge of factors affecting feeding efficiency is of vital importance to understanding any organism's relationship to its environment. The effect of one factor - variation in O2 concentration - on the filtering rate of a common freshwater zooplankton species, Daphnia pulex is described. Measurements of D. pulex filtering rate were made under exposure to a wide range of O2 concentrations and over periods of time ranging from < 1 h to 15 days. Oxygen was found to have a significant effect on the filtering rate in that below concentrations of 3 mg/O2/l the rate decreased sharply; however, following prolonged exposure (> 8-12 h) to low O2 conditions the filtering rate gradually increased and eventually D. pulex were able to filter much more rapidly than under normal concentrations. These increases in filtering rates under conditions of low O2 are directly correlated with the animals' increased production of hemoglobin when little O2 is present. (Katz)
W77-06473

SOME EFFECTS OF SALINITY ON THE TOXICITY OF COPPER TO THE POLYCHEATE NEREIS DIVERSICOLOR,
Hull Univ. (England). Dept. of Zoology.
L. H. Jones, N. V. Jones, and A. J. Radlett.
Estuarine and Coastal Marine Science, Vol. 4, p. 107-111, 1976. 2 fig, 2 tab, 10 ref.

Descriptors: *Salinity, *Metals, *Copper, *Worms, *Invertebrates, Absorption, Bioassay, Path of pollutants, Mode of action, Analytical techniques, Laboratory tests, Water quality, Salt tolerance.
Identifiers: *Polycheates, Bioaccumulation, Tissue analysis, *Nereis diversicolor.

The effect of salinity on the survival time of the polycheate Nereis diversicolor in copper solutions was investigated. Both high and low salinities increased the toxicity of copper to the worms. It was suggested that this synergistic effect, rather than the amount of copper accumulated, may be the important lethal factor. (Katz)
W77-06474

THE DEVELOPMENT OF THE LARVA OF CHLAMYS ISLANDICA IN THE PLANKTON AND ITS SALINITY TOLERANCE IN THE LABORATORY (LAMELLIBRANCHIA, PECTINIDAE),
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
Li. D. Gruffydd.
Astarte, Vol 8, No 2, p 60-68, 1976. 4 fig, 13 ref.

Descriptors: *Bivalves, *Plankton, *Salinity, *Salt tolerance, *Growth stages, *Larvae, Animal physiology, Animal behavior, Life cycles, Primary productivity, Environmental effects, Nutrient requirements, Animal metabolism, Water quality.
Identifiers: *Chlamys islandica, Metamorphosis.

The larvae of Chlamys islandica were found to spend approximately 10 weeks in plankton at 6-8 degrees C, 5 of these weeks as an eyed pediveliger. The last third of its length at metamorphosis was added during the pediveliger stage. Its size at

metamorphesis in early mid-September was 300 micrometers. When the larvae were placed in low salinities for one day, all died at 26% seawater, most were grossly damaged at 40 and 60% seawater, and a few showed damage at 80% seawater with low mortality. When placed in vertical salinity gradients, the larvae swam up until they reached 55% seawater or unitl they reached certain interphases between very different salinities. (Katz)
W77-06475

RESEARCH RELATED TO BIOLOGICAL EVALUATION OF COMPLEX WASTES,
Environmental Research Lab.-Duluth, Minn.
For primary bibliographic entry see Field 5A.
W77-06476

THE ACCUMULATION OF CADMIUM, COPPER, MANGANESE AND ZINC BY FUCCUS VESICULOSUS IN THE BRISTOL CHANNEL,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5B.
W77-06477

LABORATORY SURVIVAL OF LARVAE OF PALAEMON ELEGANS RATHKE AND OTHER CARIDEAN SHRIMPS IN RELATION TO THEIR DISTRIBUTION AND ECOLOGY,
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
T. Rochanaburanon, and D. I. Williamson.
Estuarine and Coastal Marine Science, Vol 4, No 1, p 83-91, 1976. 3 fig, 1 tab, 17 ref.

Descriptors: *Shrimp, *Crustaceans, *Life history cycles, *Growth stages, *Water temperature, *Hydrogen ion concentration, Lethal limit, Mortality, Environmental effects, Water quality, Animal physiology, Bioassay, Larvae, Metabolism, *Salinity, Laboratory tests.
Identifiers: *Survival rates, Palaemon elegans, Processa nouvelli, Crangon crangon.

Survival rates were recorded for the larval and early post-larval stages of Palaemon elegans reared in seawater at constant temperatures of 10, 15 and 20 degrees C, in four regimes of varying temperature, and in various dilutions of seawater at constant temperatures. Crangon crangon and Processa nouvelli were reared in seawater at 10, 15 and 20 degrees C. The highest sursvival rates for esch species were in seawater at 20 degrees C. Survival rates of P. elegans in cycles of changing temperature were generally similar to those at the average temperature. Some larvas of P. elegans survived to beyong metamorphosis at 20 degrees C in all salinities from 17-34% but not in lower salinities; at 15 degrees C metamorphosis was completed only in a salinity of 34%; no larvae metamorphosed at 10 degrees C in any salinity. C. crangon and P. nouvelli completed metamorphosis in undiluted seawater at 20 and 15 degrees C but not at 10 degrees C. (Katz)
W77-06478

TRACE METALS IN MUSSELS FROM THE N.W. MEDITERRANEAN,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5A.
W77-06479

RETENTION AND EXCRETION OF 203HG-LABELLED METHYLMERCURY IN RAINBOW TROUT,
Helsinki Univ. (Finland). Dept. of Radiochemistry.
M. Ruohtula, and J. K. Miettinen.
OIKOS, Vol 26, p 385-390, 1975. 5 fig, 1 tab, 14 ref.

Descriptors: *Mercury, *Salmonids, Trout, *Rainbow trout, *Metabolism, *Temperature, *Tracers, *Radioisotopes, Path of pollutants, Fish physiology, Biodegradation, Analytical techniques, Laboratory tests, Methodology, Toxins, Growth rates.
Identifiers: Retention, *Methylmercury, Excretion, Tissue analysis.

Elimination of 203HG-labelled methylmercury by rainbow trout, studied by whole body counting, followed a bi-exponential equation. The biological half-time of methylmercury varied from 202 to 516 d, depending on the retained dose and water temperature. An increase in the concentration of protein-bound methylmercury caused a significant decrease in the biological half-time. Between 0.5 and 4C the excretion of methylmercury was about 1.5 times longer (515 plus or minus 83d) than at 16-19C (348 plus or minus 78d). (Katz)
W77-06480

COMBINED TOXICITY OF FREE CHLORINE, CHLORAMINE AND TEMPERATURE TO STAGE I LARVAE OF THE AMERICAN LOBSTER HOMARUS AMERICANUS,
Woods Hole Oceanographic Institution, Mass.
J. M. Capuzzo, S. A. Lawrence, and J. A. Davidson.
Water Research, Vol 10, p 1093-1099, 1976. 6 fig, 3 tab, 15 ref.

Descriptors: *Chlorine, *Toxicity, *Lobsters, *Crustaceans, *Water temperature, *bioassay, Growth stages, Larvae, Animal physiology, Mode of action, Path of pollutants, Lethal limit, Respiration, Water pollution effects, Aquiculture.
Identifiers: *Chloramine, *American lobster, Bioaccumulation, Tissue analysis.

The differential effects of free chlorine and chloramine on stage I larvae of the american lobster Homarus Americanus were investigated in continuous flow bioassay units. Applied chloramine was more toxic than applied free chlorine to lobster larvae. The synergistic effet of temperature on the toxicity of both compounds was demonstrated with chloramine being more toxic than free chlorine. The action of each toxicant appeared to be an alteration of standard metabolic activity in respiration rates. Initial respiratory stress was detected during exposure to 0.05 mg/l applied chloramine and 5.00 mg/l applied free chlorine. The apparent chlorine demand of the seawater used in the study was determined after removal of particulate and dissolved organics and ammonia. Approximately 18% of the applied level of free chlorine and chloramine was recovered as residuals. (Katz)
W77-06482

TRANSPORT OF MERCURY THROUGH A LABORATORY TWO-LEVEL MARINE FOOD CHAIN,
Naval Research Lab., Washington, D. C. Ocean Sciences Div.
K. M. Parrish, and R. A. Carr.
Marine Pollution Bulletin, Vol 7, No 5, p 90-91, 1976. 2 fig, 6 ref.

Descriptors: *Mercury, *Metals, *Food chains, *Food webs, *Plankton, *Copepods, *Zooplankton, Primary productivity, Path of pollutants, Growth stages, Growth rates, Metabolism, Algae, Absorption, Environmental effects, Bioassay, Analytical techniques.
Identifiers: *Croomonas salina, *Acartia tonsa, Bioaccumulation.

Algal cultures grown in the presence of 164 micrograms/liter mercury as mercuric chloride acquired and retained about half of the mercury. When the algae which had been grown in the presence of mercury were fed to planktonic copepods: (1) egg-laying rate showed no significant change; (2) eggs of a female fed mercury-enriched algae hatched, and nauplii moulted to apparently normal copepodites while in contact with spiked algae, and (3) analysis of the algae/copepod system showed that neither the copepods nor their eggs and faeces retained mercury in detectable amounts. At least in the one simple food chain, although mercury was concentrated by the algae, the mercury was not passed up the chain to the next trophic level. (Katz)
W77-06484

TRACE METALS IN CHOROMYTILUS MERIDIONALIS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
H. R. Watling, and R. J. Watling.
Marine Pollution Bulletin, Vol 7, No 5, p 91-94, 1976. 3 fig, 5 tab, 9 ref.

Descriptors: *Mollusks, *Mussels, *Absorption, *Path of pollutants, *Metals, Bioindicators, Metabolism, Bioassay, Marine animals, *Zinc, *Cadmium, *Copper, *Lead, Manganese, Nickel, Cobalt, Trace elements, Africa, Bays.
Identifiers: *Bioaccumulation, *Choromytilus meridonalis, Trace metals, *Saldanha Bay(South Africa).

Concentrations of metals in mature females of the mussel Choromytilus meridionalis were approximately twice those in males. Some other trace elements also differed according to sex. It was recommended that comparative data should relate individuals of similar size if this species was used as a bioindicator of trace metal pollution and that differences in trace metal content might be due to seasonal variations or abnormal metal uptake. (Katz)
W77-06485

ACUTE TOXICITY OF INORGANIC MERCURY TO CAPITELLA,
Bedford Coll., London (England). Dept. of Zoology.
L. M. Warren.
Marine Pollution Bulletin, Vol 7, No 4, p 69-70, 1976. 2 fig, 7 ref.

Descriptors: *Worms, *Invertebrates, *Metals, *Mercury, *Lethal limit, *Toxicity, Toxins, Absorption, Path of pollutants, Metabolism, Water quality, Laboratory tests, Bioassay, Tolerance.
Identifiers: *Polycheates, Capitella capitata, Ophryotrocha labronica, Survival rates.

The polycheate worm Capitella capitata was fairly resistant to high concentrations of inorganic mercury. Survival of adults compared with those of the polycheate Ophryotrocha labronica showed that C. capitata withstood 1 ppm Mercury for several days while O. labronica succumbed to 0.5 ppm mercury in 2 hours. (Katz)
W77-06486

LEVELS OF PCBS AND DDTS IN MUSSELS FROM THE N.W. MEDITERRANEAN,
International Lab. for Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-06487

IN VIVO ACCUMULATION OF RADIOACTIVE POLONIUM BY THE GIANT KELP MACROCYSTIS PYRIFERA,
Scripps Institution of Oceanography, La Jolla, Calif. Soledad Marine Radioactivity Lab.
J. P. Cowen, V. F. Hodge, and T. R. Folsom.
Marine Biology, Vol 37, p 237-248, 1976. 6 fig, 1 tab, 29 ref.

Descriptors: *Tracers, *Isotopes, *Radioisotopes, *Radiochemical analysis, *Algae, *Phaeophyta, Laboratory tests, Absorption, Path of pollutants,

Analytical techniques, Growth rates, Growth stages.
Identifiers: *Polonium, *Macrocystis pyrifera, *Bioaccumulation, Tissue analysis, Radioactive polonium.

The in vivo accumulation rate of radioactive polonium by Macrocystis pyrifera was determined by tagging young, growing lamina and subsequently collecting for radioactive Po analysis. The rates of accumulation for observed and growth-corrected data were, respectively 0.78 x 10-9 pCi/cm2sec and 1.17 x 10-9 pCi/cm2sec. Inert, but biologically foulable, glass slide surfaces exposed to the kelp bed environment yielded Po accumulation rates of 0.64 x 10-9 pCi/cm2sec, slightly less than those of M. pyrifera. Distinction was made between observed net accumulation rate and gross rates or total flux. Several factors contributing to the final net accumulation rate were discussed. (Katz)
W77-06490

THE EFFECTS OF LOW METAL LEVELS ON A CLONAL HYDROID,
Institute for Marine Environmental Research, Plymouth (England).
A. R. D. Stebbing.
Journal of the Marine Biological Association of the United Kingdom, Vol 56, No 4, p 977-994, 1976. 6 fig, 4 tab, 63 ref.

Descriptors: *Metals, *Mercury, *Copper, *Cadmium, *Lethal limit, Invertebrates, Growth rates, Metabolism, Mode of action, Laboratory tests, Path of pollutants, Water quality, Bioassay, Marine animals, Marine biology, Lethal limit.
Identifiers: *Hydra, *Campanularia flexuosa, Bioaccumulation, Colonial organisms, *River Tamar(England).

A sensitive and precise bioassay was developed using the clonal hydroid Campanularia flexuosa for measuring the sublethal effects of marine contaminants in terms of the inhibition of colonial growth rate. A single clone could be cultured simply in the laboratory for indefinite periods. Thresholds of sensitivity to 3 metals in 11-day experiments were: Hy 1.6-1.7 micrograms/liter; Cu 10-13 micrograms/liter; and, Cd 110-280 micrograms/liter. Observations on the development of the hydroids response with time showed that sensitivity increased linearly at first, but during the second week the metals had a transitory stimulatory effect on colonial growth rate known as the Arndt-Schulz effect. (Katz)
W77-06491

EFFECTS OF FIELD APPLICATIONS OF THE HERBICIDE DIQUAT AND DICHLOBENIL ON AMPHIBIANS,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
A. S. Cooke.
Environmental Pollution, Vol 12, p 43-49, 1977. 4 tab, 15 ref.

Descriptors: *Amphibians, *Frogs, *Newts, *Toads, *Growth stages, *Halogenated pesticides, *Diquat, *Herbicides, *Chlorinated hydrocarbon pesticides, *2,6-dichlobenil, *Toxicity, Mortality, Toxins, Animal physiology, Path of pollutants, Reproduction, Growth rates, Algae, Environmental effects, Bioassay, Laboratory tests.
Identifiers: Bioaccumulation, *Rana temporaria, Bufo bufo, Triturus vulgaris.

The effects have been studied of normal field applications (1 mg. litre) of the herbicides diquat and dichlobenil on caged frog Rana temporaria and toad Bufo bufo tadpoles and on free-living populations of smooth newts Triturus vulgaris. Neither herbicide caused any mortality amongst the tadpoles or changed their development rate or level of activity. Tadpoles maintained in ponds treated with diquat, however, weighed less than control tadpoles four days after treatment and had fewer algae and diatoms in their intestines. After 18 to 32 days, tadpoles in ponds treated with either diquat or dichlobenil were heavier than control tadpoles. Herbicide treatment had resulted in blooms of algal species that the tadpoles apparently found highly acceptable. Although smooth newts bred in each pond after treatment and again the following year, herbicide treatment may have reduced the suitability of the ponds as newt breeding sites. (Katz)
W77-06492

DISTRIBUTION OF LEAD, ZINC, COPPER AND MANGANESE IN THE MARINE GASTROPODS, THAIS LAPILLUS AND LITTORINA LITTOREA, AROUND THE COAST OF WALES,
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W77-06493

EFFECTS OF IRANIAN CRUDE OIL ON THE RED SEA OCTOCORAL HETEROXENIA FUSCESCENS,
Hebrew Univ., Jerusalem (Israel). Dept. of Oceanography.
Y. Cohen, A. Nissenbaum, and R. Eisler.
Environmental Pollution, Vol 12, p 173-185, 1977. 3 fig, 2 tab, 23 ref.

Descriptors: *Toxicity, *Oil, *Water pollution sources, *Coral, *Bioassay, Invertebrates, Benthic fauna, *Oil pollution, Oil wastes, Oily water, Water quality, Analytical techniques, Animal physiology, Animal behavior, Lethal limit, Pollutant identification, Gas chromatography.
Identifiers: *Bioaccumulation, *Heteroxenia fuscescens, *Crude oil, *Red Sea, Red Sea Octocoral, *Octocoral.

Acute toxicity and sublethal effects of Iranian crude oil on colonies of the Red Sea octocoral Heteroxenia fuscescens were studied under continuous flow assay conditions. Static toxicity bioassays conducted in small (3 litre) jars at 41% salinity and 22 degrees C showed that the 12 ml/litre concentration of crude oil added at the start was fatal to 50% of the test colonies in 96 h. Colonies surviving exposure to high sublethal levels of crude oil were adversely affected both during treatment and afterwards. Tank tests conducted in large (1500 litre), deep (2 m) containers and flowing sea water demonstrated that Heteroxenia were more resistant to crude oil than when assayed in jars; no deaths were observed in tanks during exposure for 168 h to initial concentrations of 10 ml/litre (15 litres added at surface). Tank assays demonstrated a depth protective effect; the number of colonies exhibiting signs of stress decreased with increasing distance from the oil film at the surface. Gas chromotographic analysis of the hydrocarbon composition of Heteroxenia exposed to high sublethal levels of crude showed that petroleum derived hydrocarbons were incorporated into tissues. The highest level of pollutant hydrocarbons found in these colonies was about 1% of their endogenic hydrocarbon content. It was concluded that while crude oil may not be acutely toxic to Heteroxenia, exposure to high sublethal oil levels may result in long term deleterious effects. (Katz)
W77-06494

METHYLMERCURY: SECOND-GENERATION REPRODUCTIVE AND BEHAVIORAL EFFECTS ON MALLARD DUCKS,
Fish and Wildlife Research Center, Laurel, Md. Patuxent Wildlife Research Center.
G. H. Heinz.
Journal of Wildlife Management, Vol. 40, No. 4, p. 710-715, 1976. 2 tab., 15 ref.

Descriptors: *Toxicity, *Metals, *Mercury, *Ducks, *Waterfowl, *Mallard duck, *Reproduction, *Fertility, Growth rates, Growth stages, Animal physiology, Path of pollutants, Bioassay, Animal behavior, Food habits.
Identifiers: Anas platyrhynchos, *Methylmercury, Bioaccumulation.

Mallard ducks (Anas platyrhynchos) whose parents were fed a diet containing 0.5 ppm mercury (equal to about 0.1 ppm mercury in a natural diet) also were fed a diet containing 0.5 ppm mercury beginning at 9 days and continuing through their reproductive season. Mercury in the eggs of treated hens averaged 0.86 ppm. Hens fed 0.5 ppm mercury made less effficient use of feed and laid a greater percentage of eggs outside nestboxes compared with controls. Hens fed mercury also producted fewer 1-week-old ducklings than did controls. There were no significant differences between controls and ducklings from parents fed 0.5 ppm mercury in approach responses to tape-recorded material calls, in avoidance of a frightening stimulus, or in open-field behavior. Ducklings from parents fed 0.5 ppm mercury did not grow as fast as did control ducklings. (Katz)
W77-06495

THE ABUNDANCES, DISTRIBUTION AND FLUX OF NUTRIENTS AND CHLOROPHYLL A IN THE NEW YORK BIGHT APEX,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
I. W. Duedall, H. B. O'Connors, J. H. Parker, R. E. Wilson, and A. S. Robbins.
Estuarine and Coastal Marine Science, Vol. 5, No. 1, p 81-105, January 1977. 13 fig, 4 tab, 30 ref.

Descriptors: *Estuaries, *Nutrients, *Surveys, *Hudson River, New York, *New Jersey, *Chlorophyll, Bays, Coasts, Tidal effects, Distribution, Spatial distribution, On-site investigations, Distribution patterns, Salinity, Water temperature, Oceans, Water pollution sources, Turbidity, Suspended solids, Nitrites, Nitrates, Phosphates, Data collections, Evaluation, Analysis, Analytical techniques.
Identifiers: *New York Bight, Silicic acid.

Tidal, spatial, and seasonal changes in salinity; temperature; and the concentrations of ammonium, nitrite, nitrate, phosphate, silicic acid, chlorophyll a and suspended matter in the waters between Sandy Hook, New Jersey, and Rockaway Point, New York, were measured during five cruises which took place between November 1973 and June 1974. Over this period, concentrations of nutrients and chlorophyll a were much greater than those found in the adjacent coastal waters. The main source of the ammonium, nitrite, and phosphate is sewage effluent which is discharged into the waters surrounding the New York metropolital region; nitrate comes mainly from the Hudson River, and silicic acid is discharged in large amounts from river and sewage sources. The largest tidal variation in salinity and nutrient and chlorophyll a concentrations occurs near Sandy Hook where the Hudson River discharge has the greatest influence. Near Rockaway Point, nutrient and chlorophyll a concentrations are generally lower and salinities higher than those observed near Sandy Hook because of the inflow of Bight water by non-tidal currents. During the spring, freshet nutrient concentrations, especially ammonium, are low along the transect due to (1) dilution by the spring freshet, and (2) utilization by the abundant phytoplankton. Flux calculations for the June observations indicated that most of the nutrients and chlorophyll a are being transported from the lower Hudson Estuary into the New York Bight apex. (Humphreys-ISWS)
W77-06503

THE EFFECTS OF DREDGING ON WATER QUALITY IN THE NORTHWEST,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5G.
W77-06535

POLYCHLORINATED BIPHENYLS.
Hearings--Sub Comm on Fisheries and Wildlife Conservation and the Environment--Comm on Merchant Marine and Fisheries, US House of Representatives, Jan 28-30, 1975. p 1-278.

Descriptors: *Fish toxins, *Environmental effects, *Polychlorinated biphenyls, *Chemical wastes, *Industrial wastes, Pollutants, Pollution abatement, Chemicals, Lake Michigan, Hudson River, Fish, Industrial water, Industrial plants, Industrial production, Pollutants, Water pollution effects, Water pollution sources, Water pollution control.
Identifiers: Congressional hearings.

Polychlorinated biphenyls, popularly known as PCB's, are chemicals which are valued because they promote efficient use of electricity in transformers and capacitors. Unfortunately, PCB's are harmful to the environment. PCB's are environmentally mobile chemicals which find their way into our nation's waters and bioaccumulate in the food chain. The most serious present threat to human health is posed by the consumption of fish which contain higher PCB concentrations than the FDA guidelines of five parts per million (ppm). Respective concentrations of up to 165 ppm and 350 ppm have recently been found in fish in Lake Michigan and in the Hudson River. To determine what future action Congress should take with regard to PCB's, the subcommittee on Fisheries and Wildlife held three days of hearings at which representatives from industry, administrative officials, and environmental experts testified. Development of alternative chemicals, careful control of industrial discharges of PCB's, and legislative banning of all use of PCB's were some of the proposed solutions to the PCB problem. Finally, while all agree that the use of PCB's should be eliminated, there is disagreement as to how soon industry can develop and implement chemical substitutes for them. (Josepher-Florida)
W77-06554

5D. Waste Treatment Processes

FLAME SPRAYING REDUCES PUMP LEAKAGE AT WASTE WATER TREATMENT PLANT.
For primary bibliographic entry see Field 8C.
W77-06101

SUCCESS IN GRP MOULDINGS THROUGH PRODUCT AND PROCESS DIVERSIFICATION.
For primary bibliographic entry see Field 8G.
W77-06102

DESIGN SEWERS TO BE SELF-CLEANING,
For primary bibliographic entry see Field 8G.
W77-06103

WASTE TREATMENT AND SOLIDS SEPARATING SYSTEM,
Canton Textile Mills, Inc., GA. (Assignee).
J. K. Sullins.
United States Patent 3,990,974. Issued November 9, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 2, p 762, November, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, *Waste treatment, *Aerobic treatment, Outlets, Liquid wastes, Reservoirs, Air, *Separation techniques.

An aerobic system for waste treatment was patented. It includes a reservoir with an outlet. Waste liquid flows into the reservoir and outward through the outlet. An ejector in the reservoir communicates with the atmosphere. A pump interconnects with the reservoir through a conduit and with the ejector via a conduit to withdraw liquid from the reservoir and force the withdrawn liquid through the ejector in a substantially horizontal direction to impart atmospheric air to the liquid as it flows through the ejector to aerate the liquid and cause it to flow substantially horizontally. The opening in the reservoir which supplies liquid to the pump is upstream from and adjacent to the direction of liquid discharge from the ejector. A sensor senses the dissolved oxygen concentration of the liquid in the reservoir. Control means vary the speed of the pump to change the rate that the pump forces liquid through the conduit. An ejector maintains the dissolved oxygen concentration at a selected level. A wall in the reservoir's upper part accomodates flow thereunder from the ejector. A tube settler in the reservoir adjacent to the wall has several parallel juxtaposed vertical tubes. Their upper ends directly communicate with the outlet. The liquid flows upward through them and is discharged at the outlet. Settled solids fall downward through the tubes against the upward liquid flow. The tube settler is remote from the ejector's discharge end and somewhat higher. (Snyder-FIRL)
W77-06104

SEWAGE SETTLING TANK,
Sybron Corp., Rochester, N. Y. (Assignee).
R. F. McGivern.
United States Patent 3,997,444. Issued December 14, 1976. Official Gazette of the United States Patent Office, Vol. 953, No. 2, p 720, December, 1976. 1 fig.

Descriptors: *Patents, *Settling basins, Sedimentation, *Sewage treatment, Sludge, Waste water treatment, Liquid wastes, Sewage effluents, Environmental sanitation.

A patent was issued for a sewage settling tank. The tank consisted of a settling chamber with an inlet for liquid to be treated and an outlet for clarified water. At least two banks of tube settlers, arranged in a horizontal plane above the chamber bottom, and a baffle from the periphery of each bank, defining a clear water area above each bank, were employed. A sludge removal siphon carried by a floating carriage removes sludge from the tank bottom and tube settlers. (Collins-FIRL)
W77-06105

AN APPARATUS FOR WASTE WATER TREATMENT BY OZONE (OZON NI YORU HAISUI SHORI SOCHI),
Japanese Patent No. Sho 51-5278. Issued February 13, 1976. Japanese Model Utility, p 223-235, February, 1976. 1 ref.

Descriptors: *Patents, *Waste water treatment, Equipment, *Ozone, Absorption, Chemical reactions, Optimization, Mechanical equipment, Gases.

A patent was issued for a continuous waste water treatment apparatus utilizing ozone. A spiral tube was used for the contact between ozone and waste water to improve ozone absorption efficiency. Waste water to be treated was fed into the spiral tube under pressure and ozonized air was jetted into the tube through an injector. The flow rate of waste water in the tube was controlled by a pressure valve attached adjacent to the tube so that the water flow was slightly faster than the speed of the ozonized air moving up the tube. A degassing tank was connected to the end of the spiral tube. When waste water entered into this tank, the pressure decreased, liberating the dissolved ozone in the form of small gas bubbles which further increased the reaction between the waste water and the ozone. With the use of this spiral tube, the size of the ozone treatment apparatus could be reduced to 1/10 that of conventional ozone treatment apparatus and still provide nearly 100% ozone absorption efficiency. (Katayama-FIRL)
W77-06106

APPARATUS FOR BIOLOGICAL TREATMENT OF WASTE WATER,
Hormel (George A.) and Co., Austin, Minn.
C. Thissen.
United States Patent 3,997,443. Issued December 14, 1976. Official Gazette of the United States Patent Office, Vol. 953, No. 2, p 720, December, 1976. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Aerobic treatment, Mechanical equipment, Sewage treatment, Waste treatment, Sewage effluents, Environmental sanitation.

A patent was issued for an apparatus to biologically treat waste water. The apparatus involves a container for the waste water to be treated, several driven shafts extending transversely through and mounted on the tank with biological discs mounted thereon, and a means for rotating the discs in the same or opposite directions that alternately exposes them to the waste water and air for the growth of aerobic materials on their surfaces. (Collins-FIRL)
W77-06107

METHOD AND APPARATUS FOR AEROBIC SEWAGE TREATMENT,
C. E. Traverse.
United States Patent 4,002,561. Issued January 11, 1977. Official Gazette of the United States Patent Office, Vol. 954, No. 2, p 776-777, January, 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, *Aerobic treatment, *Septic tanks, Domestic wastes, Sewage disposal, Oxygen, Waste water treatment, Liquid wastes, *Waste water treatment.

A patent was issued for a method and apparatus for aerobic sewage treatment in septic tanks. The system contains a means for removing a portion of the liquid from the tank and reducing floc particle size. The liquid is placed in a cylindrical treatment vessel designed to create a hydraulic turbulence in the fluid and to provide surface means to reduce floc particle size by mechanical shear forces. Oxygen is introduced to optimize size reduction and aerobic treatment. The treated liquid is returned to the septic tank. (Collins-FIRL)
W77-06108

WASTE WATER TREATMENT PROCESS,
SCM Corp., New York. (assignee).
J. J. Joseph, and J. R. Keigher.
United States Patent 4,001,114. Issued January 4, 1977. Official Gazette of the United States Patent Office, Vol. 954, No. 1, p 295, January, 1977. 1 fig.
Identifiers: Density separation.

A patent was issued for a treatment process for waste water containing fatty residue. Density separation is employed to remove accumulated lighter oil phase from the denser aqueous phase. The denser phase is treated with a flocculating agent and brought to a pH of at least 6. It is then subjected to dissolved air flotation to recover the stripped water product phase from the oily froth formed. The waste water is acidified to a pH of approximately 3 to 5.5 before density separation, and the oil froth is allowed to flow by gravity and mix with waste water admitted to the process. (Collins-FIRL)
W77-06109

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
E. O. Box, Jr., and F. Farha, Jr.
United States Patent 3,992,295. Issued November 16, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 3, p 1210, November, 1976.

Descriptors: *Patents, *Waste water treatment, *Oxidation, Organic matter, *Water purification, Oxygenation, Copper, Manganese, Water reuse.

A patent was issued for a process to purify aqueous streams containing organic material impurities, dissolved and/or suspended, to products substantially free of organic material. This involves mixing the contaminated stream with an oxygen-containing gas and a copper manganite catalyst under liquid phase oxidation conditions at a temperature of 350 F to 550 F. The organic materials are converted to relatively innocuous forms and the stream can be safely discarded or reused. (Collins-FIRL)
W77-06110

PROCESS OF TREATING GELATINOUS SLUDGE AGGLOMERATIONS,
Environmental Improvement Systems, Inc., Birmingham, Ala. (Assignee).
H. J. Weiland, and D. W. Black.
United States Patent 3,997,438. Issued December 14, 1976. Official Gazette of the United States Patent Office, Vol. 953, No. 2, p 718, December, 1976. 1 fig.

Descriptors: *Patents, *Sludge treatment, *Filtration, Separation, Suspended solids, *Waste water treatment, Lime, Aluminum, Chemical degradation.

A patent was issued for a process to treat gelatinous sludge agglomerations containing aluminum hydroxide from the clarification of raw water with coagulants. The gelatinous sludge is reacted with lime to combine with the aluminum hydroxide to form a precipitate and produce a filterable sludge in water. This is settled in the water, and separated and passed through a filter to separate solids from the liquid. (Collins-FIRL)
W77-06111

CONVERTING SEWAGE SLUDGE INTO COMPOST.
Australian Patent 476,969. Issued October 7, 1976. Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 46, No. 37, p 3718, October, 1976.

Descriptors: *Patents, *Sludge treatment, Biological treatment, Sewage treatment, Oxygen, Temperature, Air, Gases, Organic matter.
Identifiers: *Compost(Sludge).

A patent was issued for a process to compost sewage sludge by biological decomposition. Sewage sludge and on organic additive are fed into the upper part of a reactor and air and additional oxygen are fed into the lower part of the reactor for biological decomposition. The sewage sludge and the gases flow countercurrent to each other and the air and oxygen are fed at a rate so that zones of different temperatures and oxygen concentrations prevail at different areas of the reactor. Highest temperatures are in the upper reactor and lowest temperatures are in the lower portion. Locations of high and low 02 concentrations are inversely located to high and low temperature areas. (Collins-FIRL)
W77-06112

SEWAGE TREATMENT DEVICES PARTICULARLY FOR MARINE APPLICATIONS,
Hamworthy Engineering Ltd., Dorset (England).
S. W. Wray.
United States Patent 3,992,299. Issued November 16, 1976. Official Gazette of the United States Patent Office, Vol. 952, No. 3, p 1211, November, 1976. 1 fig.

Descriptors: *Patents, *Sewage treatment, Equipment, *Activated sludge, *Aeration, *Ships, *Waste water treatment, Sludge treatment, Liquid wastes, Waste disposal.

A patent was issued for a two-container compartment for sewage treatment aboard marine vessels. The extended aeration activated sludge treatment process was employed. The first container had provisions for aeration, inlet, discharge, and flow directing means. Liquid is transferred from the first to the second container and sludge is returned to the first container. The second container also has means for skimming floating debris and returning it to the first container. Provisions are made for the removal of effluent from the second container and for protecting the process from ship movement. (Collins-FIRL)
W77-06113

THE ULTIMATE DISPOSAL OF SLUDGE,
D. K. Silvester, and K. Lewis.
The Public Health Engineer, Vol. 4, No. 6, p 153-159, November, 1976. 4 tab, 3 ref.

Descriptors: *Ultimate disposal, *Sludge disposal, *Waste water treatment, *Sludge treatment, Drying, Dewatering, Polyelectrolytes, Filters, Incineration, Liquid wastes, Organic matter, Treatment, Economics, Centrifugation.
Identifiers: Sludge thickening, Sludge conditioning, Gravity thickening, Land application.

Three forms of land disposal of sludge were considered with a discussion of the treatment methods necessary in each case. Sludge can be disposed to land as a liquid, as organic matter, or as an inert material. Local conditions must govern which methods are suitable and economically advantageous. The form and location of disposal dictate the extent of required treatment. The type of sludge controls the form of treatment. Treatment can be divided into two stages: thickening and conditioning, and dewatering and drying. Several forms of thickening and conditioning are described, such as gravity thickening, flotation thickening, elutriation, anaerobic digestion, chemical conditioning, heat treatment, and polyelectrolytes. Dewatering and drying include drying beds, filter presses, vacuum filters, belt filters, sludge concentrators, centrifuges, composting plants, and incinerators. The Buckland Water Pollution Control Centre in Newton Abbot, South Devon, England, was described as a demonstration of the evolution of a means for selecting and rejecting various alternatives. (Collins-FIRL)
W77-06114

PRESSURIZED AIR SIMPLIFIES CONVEYING SEWAGE SOLIDS,
Neptune CPC Engineering Corp., Sturbridge, Mass. Pneumatic Ejector Div.
C. T. Blanchard.
Water and Sewage Works, Vol. 123, No. 11, p 78-79, November, 1976. 3 fig.

Descriptors: *Sewage treatment, *Pipelines, *Pressure conduits, Solid wastes, Mechanical equipment, Distribution systems, Sewerage, Treatment facilities, Automatic control.
Identifiers: CPC Pneumatic Ejector System.

Pneumatic systems have been used for material transport for over 50 years. The application of pneumatic ejectors in sewage treatment was proposed over 40 years ago, but a system which could tie into modern treatment works has just recently been developed. The CPC Pneumatic Ejector System is capable of moving dry sand and pumping water as well as moving solids with a moisture content varying between these extremes. The basic theory of operation is Boyle's Law. The material is fed into the top of the ejector by conveyor and air (stored at 100 psi) moves the material in the pipeline to its destination. Critical factors involved are sizing the air receiver and compressor as well as the design of the ejector cycle profile. Ejectors, control valves, discharge pipe, fittings and special discharge hoppers are designed and manufactured for maximum protection against wear. Manual and automatic control panels are available. In addition, there is a 'bottom loading' ejector for tickened sludge or other materials that behave like a liquid. Advantages of pneumatically conveying grit, screenings and sludge safely in enclosed pipe, in any direction, can be applied to small or large plants. It can be applied to new construction or it can be an economic alternative for upgrading older plants. (Collins-FIRL)
W77-06115

THE USE AND RE-USE OF SEWAGE EFFLUENT,
Thames Water Authority, London (England).
G. C. Cox, and T. H. Humphris.
Water Pollution Control, Vol. 75, No. 4, p 413-427, 1976. 10 fig, 2 tab, 23 ref.

Descriptors: *Water reuse, *Power plants, *Cooling towers, *Waste water treatment, *Sewage effluents, Treatment facilities, Biological treatment, Nitrification, Denitrification, Sewage treatment, Recycling.

Experiences at the Croydon Power Station, in England, with sewage effluent used as cooling water for condensers was reported. This use of sewage effluent has proven economical and beneficial to the waterway receiving the effluent. At this plant, sewage effluent was combined with small amounts of borehole water. In addition, concern was shown for cleaning the condensers. The condenser deposit was a form of calcium phosphate and small quantities of calcium carbonate. Laboratory tests were conducted to determine characteristics of the sewage effluent for control purposes. In comparison with other cooling water systems, it was found that bacterial oxidation could be used as a means of reducing chemical treatment costs. The use of sewage effluent may provide a way around the use of enormous amounts of fresh water and the waste heat of generating plants can be used in sewage treatment. Conditions in a power station cooling tower are nearly optimum for nitrification and could prove valuable in sewage treatment. Cooling towers might also be used for denitrification purposes. Experiments are suggested to determine the usefulness of developing combined power generation and sewage treatment plants. (Collins-FIRL)
W77-06116

WASTEWATER TREATMENT UNIT FEATURES FLUIDIZED BED.
Ecolotrol, Inc., Bethpage, N. Y.
Chemical Engineering, Vol. 83, No. 23, p 87-88, October, 1976. 1 fig, 1 tab.

Descriptors: *Filtration, *Waste water treatment, *Biological treatment, Nitrification, Denitrification, Activated sludge, Biochemical oxygen demand, Flow, Microorganisms, Treatment facilities.
Identifiers: *Fluidized-bed treatment.

The Hy-Flo fluidized-bed waste water treatment system is described for biologically treating waste water for carbonaceous BOD removal, nitrification of ammonia nitrogen to nitrates, and denitrification of nitrates to nitrogen. The modular system is economically competitive with other systems and can increase plant capacity by the addition of reactors. It is a closed system requiring no activated sludge return to the reactor. It is composed of a vertical column filled with a medium, such as sand, with a bacterial and other high-order microorganism population coating the surface of each particle of the medium. Waste water, which can be preoxygenated, is introduced into the bottom of the column at a flow rate of 10-25 gallons/minute/square foot of reactor cross-section area. Continuous fluidization of the bed is assured and eliminates packing of solids and reactor clogging. Treatment times were found to produce 85-90% removal of BOD in 15 minutes compared to normal removal times of 6-8 hours. The system is less susceptible to toxic shock loads. (Collins-FIRL)

W77-06117

GAS FROM SEWAGE, SLUDGE PYROLYSIS ENERGY SOURCE SAYS CALIFORNIA STUDY.
Canadian Pulp and Paper Industry, Vol. 29, No. 11, p 10, November, 1976.

Descriptors: *Incineration, *Ultimate disposal, *Waste water treatment, *Treatment facilities, Sewage disposal, Municipal wastes, Tertiary treatment, Fuels, Domestic wastes, Water reuse, California.
Identifiers: *Pyrolysis, Multiple hearth furnace, Refuse-derived fuel, Concord(Calif).

Tests at the Concord, California, Waste Water Treatment Plant proved that pyrolysis of municipal solid waste and sewage sludge could be an energy source for waste water treatment plants. A multiple hearth furnace was used for the pyrolysis of various mixtures of refuse and sludge. The object was to cut costs of tertiary waste water treatment and solids disposal at a new plant being constructed. The new plant was to recycle domestic sewage into high quality water for cooling and industrial processes. The recommendation was that there be shredding accompanied by metal removal and air classification of solid waste to produce a refuse-derived fuel (RDF). This fuel is then fed to the furnace with the sewage and pyrolyzed into a combustible gas. No other fuel is needed for the process. The fuel gas has sufficient entropy to make steam and power generation economically viable. Temperatures of more than 2400F were achieved. (Collins-FIRL)
W77-06118

THE OXYGEN-ACTIVATED SLUDGE PROCESS -- THEORY AND PRACTICE,
R. C. Singh.
Journal of The Institution of Engineers (India), Vol. 56, Part EN 3, p 108-114, June, 1976. 2 fig, 2 tab, 16 ref.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Biochemical oxygen demand, *Treatment facilities, Oxygen, Air, Aerobic conditions, Microorganisms, Dissolved oxygen.
Identifiers: *Oxygen activated sludge.

The ability to produce oxygen economically has made its use possible instead of air in the activated sludge process. An oxygen atmosphere creates a different environment from an air atmosphere, and the two should be evaluated independently. Theoretical considerations, experimental evidence, and working results of pilot and full scale plants are discussed. The advantages of using oxygen in the activated sludge process are presented. The oxygen activated sludge process has been proved economically viable in actual field installations treating municipal and varied industrial wastes. Its advantages arise from its ability to maintain a high dissolved oxygen level in the mixed liquor, efficient oxygen transfer at low mixing velocities, quick removal of the gases of decomposition, and capability for automatic operation. Due to use of covered reactors, less land area is needed. Treatment time is significantly reduced. The effluent has high concentration of dissolved oxygen and is well nitrified. The excess sludge has higher bio-mass per unit volume and a low sludge volume index. The food to micro-organisms ratio is increased, making possible higher biochemical oxygen demand (BOD) loading per unit weight of mixed liquor volatile suspended solids (MLVSS). High MLVSS concentration can be maintained in the reactor so that more BOD per unit reactor volume can be applied. The sludge settling and compacting properties are excellent. Pumping for sludge recirculation is less expensive. Dewatering, processing, and disposing of excess sludge are easier. Bulking is eliminated. The effect of temperature on oxygen absorption rate is minimized. The covered aeration tanks minimize odor nuisance. (Snyder-FIRL)

W77-06119

FILTRATION RESEARCH IN UK UNIVERSITIES,
Exeter Univ. (England). Dept. of Chemical Engineering.
R. J. Wakeman.
The Chemical Engineer, No. 314, p 683-685, 703, October, 1976. 4 tab, 75 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Filtration, *Research and development, *Foreign research, Universities, Slurries, Moisture content, Dewatering, Filters.
Identifiers: Filter cakes.

Current contributions to research in filtration by workers at British universities and research centers are briefly surveyed. Measurements of the influence of slurry concentration on filter cake moisture contents are being made, and cake dewatering mechanisms are being examined with respect to the nature of the particles, their size distribution, and the compressibility of the cake. Pilot scale experiments on depth filtration as applied to water treatment are being extended to full scale filters with particular reference to the use of anionic polyelectrolytes suitable for the treatment of low turbidity reservoir waters and to the kinetics of phenol oxidation within filters. Sludge dewatering is being examined, with some emphasis on the nature of the solids found in effluents and the validity of filtration theory when applied to sewage sludges. Research in the United Kingdom is making an important contribution to the gradual transformation of filtration from an art to a science. (Snyder-FIRL)
W77-06120

RESIDUAL SATURATION OF DEWATERED FILTER CAKES,
Exeter Univ. (England). Dept. of Chemical Engineering.
R. J. Wakeman, A. Rushton, and L. N. Brewis.
The Chemical Engineer, No. 314, p 668-670, October, 1976. 5 fig, 1 tab, 15 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Saturation, *Dewatering, Packed beds, Liquids, Equilibrium.
Identifiers: Filter cakes.

When a packed bed of solid particles initially saturated with a liquid is drained by a desaturating driving force, a quantity of liquid, the residual saturation, is retained at equilibrium. In cases such as sewage sludge, transport costs of wet sludge may be reduced considerably by effective dewatering. Movement and retention of fluid in centrifuged filter cakes have been studied experimentally. Ballotini and sieved sand fractions were used as solids with a vertical, 0.2286 m diameter, perforate bowl centrifuge. A cake formed by filtering the particles into the centrifuge was allowed to drain to a final equilibrium saturation level corresponding to the centrifugal force developed at a specific rotational speed. The measured values of the residual equilibrium saturation were compared with previously predicted saturation levels. The inadequacy of the capillary number and previously used permeability expressions to correlate residual saturation data was demonstrated, along with the failure of the simple two-regime model. It is doubtful that capillary drain height correlations from gravity drained beds can be applied to centrifugally dewatered cakes. The effect of rotational speed on cake permeability was explained in terms of the range of pore sizes contributing to fluid flow. (Snyder-FIRL)
W77-06121

USES AND CULTIVATION OF SEAWEEDS,
Plymouth State Coll., N. H. Dept. of Natural Sciences.
R. A. Fralick, and J. H. Ryther.
Oceanus, Vol. 19, No. 4, p 33-39, Summer, 1976. 5 fig, 1 tab, 13 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Biological treatment, *Cultivation, Projects, *Recycling, Shellfish farming, Sewage effluents.
Identifiers: *Seaweeds.

The uses and cultivation of seaweeds are discussed. They include a project begun in 1970 at the Woods Hole Oceanographic Institution to develop a waste recycling-marine aquaculture system. Secondary sewage effluent, mixed with seawater, is used to grow phytoplankton which is later fed to oysters, clams, and other bivalves. The algae remove nutrients, primarily nitrogen, from the waste water, and the shellfish remove the algae, providing tertiary sewage treatment as well as commercially valuable seafood. Metabolism of the animals in the system remineralizes some of the nutrients; nitrogen and phosphorus return to the water by way of the animals' wastes. This phenomenon necessitated the addition of seaweeds grown in suspended culture to remove the regenerated nutrients. Initially chondrus crispus was used in this project, but it grew slowly and became heavily overgrown with epiphytic seaweeds. It was replaced by other warm-water species that appear as summer annuals in the Woods Hole region. The growth of these algae, especially Neoagardhiella and Gracilaria, has been so successful that a separate project was begun in which the seaweeds alone are grown in mixtures of sewage effluent and seawater as a one-step waste recycling-aquaculture system. Similar experiments were started in 1973 at the Harbor Branch Foundation, Ft. Pierce, Florida, using more tropical species of seaweeds. (Snyder-FIRL)
W77-06122

FILTRATION WITH GRANULAR BEDS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. L. Cleasby.
The Chemical Engineer, No. 314, p 663-667, October, 1976. 2 fig, 4 tab.

Descriptors: *Waste water treatment, *Biological treatment, Analytical techniques, *Treatment facilities, *Filtration, Suspension, Sands, Coals, Suspended solids, Filters.
Identifiers: *Granular bed filtration.

Granular bed filtration as applied to water and waste water treatment is discussed. It involves the passage of dilute suspensions of particulates through beds of granular material 0.6 m to 1.8 m deep to separate the unwanted solids. The suspensions may reach 50 mg/liter in waste water filtration. The beds may be composed of natural sand or crushed anthracite, flint, garnet, illmenite, or pumice. The materials are sieved to provide the desired size range. Such filters can process large quantities of water at low cost. The traditional slow sand filter has been largely supplanted by the rapid filter. Rapid, granular filters are used to polish the effluent from conventional secondary biological treatment works to meet more stringent effluent quality requirements. Various designs have evolved to accommodate higher solids loads. Removal results from a combination of interstitial straining, transport mechanisms, and attachment mechanisms. Macroscopic physical models of filtration are based on the fact that the rate of removal per unit depth of filter is proportional to the local concentration of suspended solids. More recent attempts to model deep bed filter behavior have been founded on the trajectory of small particles as they approach a larger collector. Three basic backwashing systems are currently in use: air scour followed by water at velocities barely sufficient to fluidize the bed, upflow wash with water at sufficient velocity to fluidize the bed fully, and simultaneous air scour and water upwash. (Snyder-FIRL)
W77-06123

PURIFICATION PLANTS OF THE CARROUSEL TYPE FOR THE PURIFICATION OF COMMUNAL, TRADE AND INDUSTRIAL WASTE WATER (KLAERANLAGEN VOM TYP CARROUSEL FUER DIE REINIGUNG KOMMUNALER, GEWERBLICHER UND INDUSTRIELLER ABWAESSER),
W. Christ.
Industrieabwaesser, p 13-19, 1976. 3 fig, 11 tab, 9 ref.

Descriptors: *Water purification, *Treatment facilities, *Oxidation, *Oxidation lagoons, Aeration, Municipal wastes, Industrial wastes, *Waste water treatment, Biological treatment.

A carrousel-type sewage treatment plant for the purification of municipal, occupational, and industrial sewage was described. The carrousel system was developed as a modification of the oxidation ditch. Its advantages could be applied to high connecting values. The system under discussion was based on the use of rotary aerators in oxidation ditches with separation of the ventilation zone and aerators from the rest of the ditch content. The rotary aerator was thereby adapted to the capacity required while vouchsafing the oxygen input. In the remaining parts of the tank, divided into two by a partition wall, the necessary speeds were maintained by rotary aerator action. The spiral motion engendered by the aerators continued as a straightforward current through the entire ditch and was returned at its end to the rotary aerator by opening the partition wall. The benefits of this process involved greater padding capacity attributable to the large sludge quantity, large storage capacity for excess sludge, high load tolerance for sewage and sludge peaks, squat construction, and simple procedure and nitrification/denitrification processes. Comparison of construction costs of carrousel-type installations with those of other wholly biological purification plants showed an economy of up to 35%. (Tallert-FIRL)
W77-06124

NEW REFUSE INCINERATOR TO BURN ATOMIZED SLUDGE,
For primary bibliographic entry see Field 5E.
W77-06125

THE ELECTROFLOTATION OF ORGANIC WASTES,
F. Barrett.
Chemistry and Industry, No. 20, p 880-882, October, 1976.

Descriptors: *Separation techniques, *Waste water treatment, *Sludge treatment, *Flocculation, *Electrodes, Sewage effluent, Corrosion, Frothing, Flotation, *Organic wastes.
Identifiers: *Electroflotation.

A discussion was presented on the development and application of electroflotation for effluent treatment. Electroflotation was investigated as a means of avoiding the disadvantages of other methods of separation in waste water treatment. The forms of this method have been air injection or diffusion for a froth separation system, and air dissolution in the effluent, under pressure, released as bubbles into the main portion of the liquor at normal pressure. Major considerations for the use of electroflotation include: good coverage of the container area by suitable electrode arrangements if used to produce gaseous bubbles; assistance of flocculation of particles if bubbles produced were introduced with minimum turbulence in the liquor body; and variation in dwell time under these conditions to suit the effluent under treatment and intensify the action. The unit is composed of a holding tank (rectangular) containing the effluent and a pair of electrodes near the bottom with the cathode above the anode. Direct current potential is applied across the electrodes which auses electrolyzed water to produce bubbles of oxygen at the anode and hydrogen at the cathode. These rise to the surface, carrying suspended particles with them, thus producing a floating sludge layer which can be removed by brushing or scraping. Titanium electrodes have proven less susceptible to corrosion and produce better results than mild steel, stainless steel, or platinized titanium. Application of this method was suitable to sludge thickening and to treating waste effluents from printing units applying flexographic ink, until the less expensive and longer-lived electrode material was developed. (Collins-FIRL)
W77-06126

ADSORPTION, COAGULATION AND FILTRATION MAKE A USEFUL TREATMENT COMBINATION - PART 1,
Rensselaar Polytechnic Inst., Troy, N. Y.
L. K. Wang, R. G. Ross, and V. J. Ciccone.
Water and Sewage Works, Vol. 123, No. 12, p 42, 44-47, December, 1976. 1 fig, 5 tab, 17 ref.

Descriptors: *Treatment facilities, *Waste water treatment, *Domestic water, *Domestic wastes, Military aspects, Laboratory tests, Biological treatment, *Adsorption, *Filtration, *Coagulation, Economics, Analytical techniques.

A study was conducted to determine the applicability and practicality of adapting a mobile water purification plant using an adsorption-coagulation-filtration process to military applications in treating field kitchen, laundry, and shower waste waters. The preliminary process selection and subsequent technical approach to eatability studies were presented. Factors involved included: characteristics of target wastes; level of waste treatment required, mobility of the treatment cacility; simplicity of installation and treatment; compatibility of treatment facilities with other military operations; costs involved and preference of military administration and management. Since the waste streams to be treated contain non-hazardous anionic surfactants, and dissolved and suspended solids, treatment equivalent to secondary biological waste treatment was suggested. With these criteria in mind, a literature earch was conducted to find feasible waste treatment processes which use the units of eeding, mixing, flocculation, filtrations, and sludge concentration. Selected processes included powdered activated carbon adsorption, polymer coagulation, and diatomaceous earth filtration. After the treatment system was planned, laboratory tests were conducted to determine the optimum types and dosages of powdered carbon and polymer, and optimum operational conditions. A summary of the procedures and results were presented. (Collins-FIRL)
W77-06127

DISINFECTION OF VIRUSES IN SEWAGE BY OZONE,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
E. Katzenelson, and N. Biedermann.
Water Research, Vol. 10, No. 7, p 629-631, 1976. 2 fig, 6 ref.

Descriptors: *Ozone, *Viruses, *Disinfection, *Sewage treatment, Chemical reactions, Reduction(Chemical), Organic matter, Sewage effluent, Treatment, Analytical techniques, *Waste water treatment.

Ozone was found to be a very potent viral disinfectant, even in contaminated water. Tests were conducted for the ability of ozone to inactivate waterborne viruses during sewage treatment. In one method, filtered sewage together with a virus inoculum was added to a buffer solution containing known concentrations of ozone. The complete disappearance of ozone immediately after the addition of the effluent was found. At the same time, a rapid reduction in virus titer occurred, but after initial reduction this titer remained unchanged. The degree of virus inactivation was dependent upon ozone concentration and the amount of organic matter in the effluent. In a second method, ozone was bubbled into filtered sewage containing a virus inoculum. Inactivation of the virus began after a 30 second lag, even efore residual ozone could be detected. Inactivation of 99.999% of the virus s found when the ozone residual was 9.6 mg/liter. Similar experiments using buffer rather than sewage showed that the process took place at an even faster rate. (Kramer-FIRL)
W77-06128

ADDITIONAL STUDIES ON THE USE OF CRACKING CATALYSTS IN CONJUNCTION WITH ACTIVATED SLUDGE WASTE WATER TREATING,
Exxon Research and Engineering Co., Linden, N. J.
R. D. Schwartz, and C. J. McCoy.
Water, Air, and Soil Pollution, Vol. 6, No. 1, p 97-102, August, 1976. 1 fig, 5 tab, 1 ref.

Descriptors: *Catalysts, *Waste water treatment, Analysis, *Sludge treatment, Sedimentation, Compaction, Chemical reactions, Carbon, Metals, *Activated sludge.

Fresh, spent, and regenerated cracking catalysts were examined to see if observed activity could be due to carbon and metals deposited on the catalyst during cracking operations. Earlier studies were repeated and adsorption isotherm tests were conducted. Sludge and waste water samples were taken during wet-weather conditions which were probably responsible for poor settling and compaction noted with controls. Catalyst addition caused test activated sludge to compact better than the control. The failure of catalysts fines to settle resulted in poor supernatant optical clarity. It was thought that adding the catalyst would aid operation under wider loadings and throughputs without affecting sludge settling and compaction. There was little difference in the performance of fresh, spent, or regenerated catalyst and the ability to operate at concentrations as low as 0.5 g/100 millimeters. When sludge and water were sampled during more normal conditions, the catalyst addition produced the same increases in settling and compaction. Results indicated that carbon and metals on the catalyst surface had no effect on settling and compaction improvement when the catalyst is present and they did not affect TOC removals. None of the catalysts adsorbed soluble TOC well and the catalyst could possibly stabilize the activated sludge system during wet weather conditions. (Collins-FIRL)
W77-06129

THE FIRST FLUOSOLIDS INCINERATOR COMMISSIONED IN THE U.K.
Engineers' Digest, Vol. 37, No. 11, p 51, November, 1976.

Descriptors: *Incineration, *Sludge treatment, Sedimentation, Filtration, Oxygen, Oxidation, Organic matter, Temperature, Water reuse, Mechanical equipment, *Waste water treatment.
Identifiers: Fluosolids incineration.

The Thames Water Authority (England) has constructed a treament plant which comprises a mechanicly raked screen, detritor, primary sedimentation, biological filters, humus tanks, microstrainers, and sludge incineration. Humus sludge is returned to primary sedimentation tanks and mixed sludge is pumped to one of three thickeners which have automatic dewatering cells designed to remove supernatent and subnatent water bands. Sludge dewatering is by vacuum filtration. Sludge from the thickeners is pumped to rotating conditioning tanks where lime and coppers are used for conditioning before filtration. Conditioned sludge is fed into the coilfilter bath and sludge cake from this step is fed to the sludge pumps which feed the FluoSolids reactor or into a skip for transporta-

tion. The reactor fluid bed is a mixture of sand and gases in suspension and provides an ideal environment for thermal oxidation of sewage sludge. The water content of the sludge cake evaporates quickly and the organic content reacts with oxygen, providing complete combustion with minimum excess oxygen at a minimum temperature. Exit gases flow into the heat exchanger and then into a scrubber followed by a mult-tray cooling system. Solids are transferred from the gas stream to the liquid scrubbing stream. Scrubber water is recycled and as ash content builds up, scrubber water with about 2% ash is pumped to lagoons where rapid settling leaves a bed of inert ash. The plant can be shut down instantly without harm or a need to provide quench water or maintain cooling air. (Collins-FIRL)
W77-06130

MODULES PERMIT EASY EXPANSION,
Robert and Co. Associates, West Palm Beach, Fla.
J. H. Weaver.
Water and Wastes Engineering, Vol. 13, No. 11, p 73-74, November, 1976. 1 fig.

Descriptors: *Treatment facilities, *Activated sludge, *Sewage treatment, *Sludge treatment, *Waste disposal, Environmental control, Costs, Sludge digestion, Aeration, Underground waste disposal, Design, Energy, *Florida.
Identifiers: West Palm Beach County(Fla), Deep-well disposal.

A regional treatment facility was recently constructed in West Palm Beach County, Florida. A regional plant was chosen because West Palm Beach and other neighboring communities were facing various difficulties with waste disposal and inadequate treatment facilities. Ocean dumping was considered an environmental hazard, some communities were being pushed to upgrade their treatment, and there was pressure to join a federally funded program to aid financing of treatment expansion. Unique features of the plant include: modular design for easy expansion; large diameter high-volume disposal wells, and the use of extended aeration activated sludge treatment in a large facility. Deep-well disposal is an innovative alternative to ocean outfall disposal. Other available options are opportunities to add treatment stages to produce high quality water to supplement regional raw water supplies. The plant is composed of measuring flumes, bar screens, grit removal devices, aeration basins, secondary clarifiers, recirculation and waste sludge pumps, a chlorination chamber, aerobic sludge digesters, an effluent pump station, and the effluent wells. Treatment is based on 'solid retention time' and BOD and suspended solids removal is over 90%, while 100% of the bacteria is removed. Cost saving design features produced about a 15% reduction over costs for conventional activated sludge treatment, rather than the estimated 15-20% increase in costs. Emergency power systems are provided. The plant is fed electricity from two feed lines in opposite directions because the area is hurricane-prone. (Collins-FIRL)
W77-06131

SLUDGE TREATMENT SPECIALISTS.
Power and Plant, p 1, 4, November, 1976. 2 fig.

Descriptors: *Sludge treatment, Equipment, *Dewatering, *Sludge digestion, *Sludge disposal, Activated sludge, Drying, Municipal wastes, Industrial wastes, *Waste water treatment.
Identifiers: Sludge thickening, Pasteurization.

Various items manufactured by Alfa-Laval, Limited found extensive use in municipal and industrial waste treatment. Previously involved in plants using sludge dewatering by centrifugation, Alfa-Laval has expanded its product range to include waste activated sludge concentration plants, sludge pasteurization and/or digester heating, and sludge drying. The waste activated sludge concentration plant can continuously thicken municipal or industrial sludges from 0.15% w/w D. S. to 6% w/w D. S. depending on the feed characteristics. The pasteurization plant uses a short time/high temperature sludge treatment which reduces costs. Sludge drying equipment dries the sludge after dewatering and produces it in a sterilized powder usuable as fertilizer. It applies a maximum temperature to the solid surface and maintains a moist surface by diffusion within the solid. Because these items are sized to fit existing centrifuge sludge dewatering equipment, a sterile powdered sludge can be produced from raw primary or waste activated sludge feed. (Collins-FIRL)
W77-06132

OZONE DISINFECTION OF SECONDARY EFFLUENTS,
Welsbach Ozone Systems Corp., Philadelphia, Pa.
C. Nebel, R. D. Gottschling, P. C. Unangst, H. J. O'Neill, and G. V. Zintel.
Journal of the Boston Society of Civil Engineers Section-ASCE, Vol. 62, No. 4, p 161-187, January, 1976. 19 fig, 3 tab, 41 ref.

Descriptors: *Ozone, *Sewage treatment, *Sewage effluents, *Tertiary treatment, *Disinfection, Froth flotation, Suspended solids, Chemical oxygen demand, Dissolved oxygen, Environmental effects, *Waste water treatment.

Previous studies have established that ozone treatment of sewage and storm water overflow where ozone dosages of 10 to 100 mg/liter are required; as a tertiary treatment to convert secondary effluent to water of potable quality where dosages of over 50 mg/liter are required; and as a replacement for chlorine for disinfection whereby a certain degree of tertiary treatment is concurrently observed and ozone dosages of 5 to 15 mg/liter are required. This investigation details the specific ozone dosages required for disinfection and discusses the effectiveness of removal of specific contaminants in the effluent. Ozone disinfection is often chosen because it leaves no harmful residual or reaction products in the receiving stream. Contaminant removal by using ozone to produce a frothing operation is described. In addition, visual characteristics of the ozonated effluent, such as suspended solids, turbidity, and color are reduced. A correlation was made between the rate of reduction and the initial COD level of the effluent. Additionally, the effect of ozonated secondary effluent on the environment was discussed, taking into account such considerations as dissolved oxygen levels, pH changes, safety, and the removal of cyanides, detergents, pesticides, and phenols. (Kramer-FIRL)
W77-06133

NEW SCREENINGS REMOVAL AND DEWATERING APPARATUS.
Effluent and Water Treatment Journal, Vol. 16, No. 11, p 583, November, 1976.

Descriptors: *Screens, *Sewage treatment, *Dewatering, *Waste water treatment, Equipment, Hydraulic equipment, Suspended solids, Effluents, Filters, Waste treatment.
Identifiers: Screezer.

An apparatus called a 'Screezer' was designed to fine screen raw sewage, lift screenings clear of the liquid and press them, and remove fibrous and harder material in a nearly dry condition. Water and softer material fall back into the main sewage flow. The screenings are ejected in a 60% compacted condition. The 'Screezer' is easily fitted to existing sewage works. It is made of a sectioned drum with cutter bars for the softer material and a spiral flow 'Screezer' chamber, and an inverted siphon attached to the chamber which empties into the downstream channel. The chambers should be constructed in concrete, but asbestos cement forms can be used as permanent shutterings in the form of 'U' bends below the apparatus. (Collins-FIRL)
W77-06135

GEORGIA PLANT IS A PEACH,
Clayton County Water Authority, Morrow, Ga. R. L. Jackson Plant.
C. E. Cason.
Water and Wastes Engineering, Vol. 13, No. 11, p 106-107, November, 1976. 1 tab.

Descriptors: *Treatment facilities, *Anaerobic digestion, *Tertiary treatment, *Sewage treatment, *Waste water treatment, Domestic wastes, Septic tanks, Separation, Sludge treatment, Biochemical oxygen demand, Suspended solids, *Georgia.
Identifiers: Clayton County(Ga).

The Clayton County (Georgia) Water Authority built a new treatment plant utilizing anaerobic digestion and tertiary lagoons because of the rapid industrial and residential growth of the Atlanta, Georgia, region. Processes in the three-year-old plant involve passing influent through a grit collector and a bar screen; moving mixed liquor clockwise around an aeration tank where dissolved and colloidal solids are oxidized to settleable solids; and passing solids to the head of the plant as 'return sludge' while effluent is being discharged. At this plant, 140,000 gallons of sludge is returned and 270,000 of effluent is discharged during the process. Return sludge aids aerobic action on the raw influent. Tertiary treatment is automated. A baffle creates rising air bubbles with the aid of screens. High BOD is achieved and suspended solids reduction is substantial. BOD removals average 97% or better; suspended solids removal is as high as 93%. In addition to domestic wastes, septic tank wastes are treated after direct dumping into the system ahead of the bar screen and grit collector. The diffused-air tertiary system has proven beneficial in handling this type of loading. Lagoon effluent is very clear. Power and maintenance requirements are very slight because there is little equipment, the only moving parts being in the two blowers for creating bubbles in the lagoon. Line cleaning requires about 120 pounds/annually of anhydrous HCl gas. (Collin-FIRL)
W77-06136

SLUDGE INCINERATOR PROVES A SUCCESS.
Water and Waste Treatment, Vol. 19, No. 11, p 38-39, November 1976.

Descriptors: *Incinerators, *Sludge treatment, *Treatment facilities, *Waste treatment, Water reuse, Costs, Performance, Evaluation, Water utilization, Equipment.

An extremely sophicated sludge incinerator has proven successful in Britain. The system duplicates all principle ancillary equipment and utilizes recirculated treated waste water for its water needs. After shutdown periods, heat losses from the shell and heat reservoir of the sand bed are minimal. With no movable parts in the reactor, shutdown can be instantaneous without harm to the facility. Performance has been better than expected and costs lower than predicted. The treatment is composed of a mechanically raked screen, a detritor, a primary sedimentation, biological filters, humus tanks, micro-strainers, and a sludge incinerator. (Collins-FIRL)
W77-06137

SLUDGE, GARBAGE MAY FUEL CALIFORNIA SEWAGE PLANT,
Brown and Caldwell, Walnut Creek, Calif.
R. B. Sieger, and B. D. Bracken.
The American City and County, Vol. 92, No. 1, p 37-38, January, 1977. 1 fig, 1 tab.

Descriptors: *Fuels, *Treatment facilities, *Sludge treatment, *Incineration, Energy, Fossil fuels, Gases, *Waste water treatment, Sewage treatment, Separation, *California, *Recycling.

Identifiers: Pyrolysis, Multiple-hearth furnaces, Resource recovery, Contra Costa Sanitary District(Calif).

The Contra Costa (California) Sanitary District's new 30 mgd waste water treatment plant utilizes a multiple hearth incinerator which produces an off-gas with enough heat energy to power the whole plant. A study was conducted to recommend the most efficient resource recovery method. After laboratory testing, combustion and pyrolysis of sewage sludge and refuse-derived fuel (RDF) in multiple-hearth furnaces was accepted. Testing indicated that the furnace could operate in an autothermic condition with RDF instead of fossil fuel under incineration and pyrolysis conditions. Considerations for RDF preparation and a description of the various technical factors involved in the system are presented. (Collins-FIRL)
W77-06138

NEW METHODS TREAT SEWAGE PLANT DISCHARGES.
Engineering News Record, Vol. 198, No. 2, p 12 January, 1977.

Descriptors: *Sewage treatment, *Ozone, *Dewatering, *Solid wastes, *Sludge disposal, *Aerobic treatment, Costs, Chlorination, Disinfection, Treatment facilities, *Waste water treatment.
Identifiers: Composting, Land disposal.

Two new processes for sewage plant discharge treatment were reviewed. The first disposes sludge by mixing with shredded solid waste and producing a pasteurized compost, while the second utilizes ozone as an effluent disinfectant to eliminate carcinogens formed by chlorine disinfection. The composting plant combines dewatered sludge and nonrecyclable solid wastes to avoid the odors associated with land disposal. With this system, the sludge-refuse mix is formed into 25 lb briquettes and allowed to cure aerobically for 2-3 weeks to eliminate the odors. The ozone method produces ozone directly in untreated air with a miniturized high-volume electron beam generator. This method is predicted to provide treatment at one-third the cost of chlorine treatment. Costs of the first system are expected to be about $4.3 million for the construction of a facility to handle 480 tons/day and $6/ton for operational expenses. (Collins-FIRL)
W77-06139

ADVANCED SEWAGE TREATMENT PLANT OPERATIONAL.
Effluent and Water Treatment Journal, Vol. 16, No. 11, p 581, November, 1976.

Descriptors: *Sewage treatment, *Tertiary treatment, *Automatic control, *Control systems, Engineering, *Treatment facilities, Activated sludge, Biological treatment, *Waste water treatment, Engineering education.
Identifiers: Norwich(England).

One of the most advanced sewage treatment plants has become operational near Norwich, England. It involves a computer-based process control system that allows nearly complete automatic control of plant processes. These controls have aided expansion of the works from a 34,000 cu m/day facility to one with a capacity for 55,000 cu m/day. The control system makes only a minimal work force necessary and treatment includes biological filtration and an activated sludge system. For the activated sludge process, the controls automatically measure and control flow rates and dissolved oxygen levels, and they monitor electrical systems for optimal operation. There are controls to protect against flooding possibilities. Details are given for the automatic control of specific processes. Though a small staff is used with automatically controlled plants, it was suggested that personnel be well-trained. (Collins-FIRL)
W77-06140

OZONATION OF RECLAIMED WATER.
Effluent and Water Treatment Journal, Vol. 16, No. 11, p 559, November, 1976.

Descriptors: *Ozone, *Waste water treatment, *Chlorine, *Disinfection, *Treatment facilities, Oxidation, Active carbon, Adsorption, Ammonia, Organic matter, Africa, *Reclaimed water.
Identifiers: Stander Water Reclamation Plant(South Africa).

The Stander Water Reclamation Plant, Daspoort, South Africa, uses chlorine to disinfect water reclaimed from sewage. Investigations were made concerning the use of ozone as a substitute for chlorine disinfection. Advantages of ozone were found to be a four-fold increase in effectiveness with one-fourth of the quantity of disinfectant, more effective oxidation, and more complete removal of organic compounds when combined with active carbon adsorption. Ozone does not react with ammonia to the same degree as chlorine and chlorine produces greater mineralization of the water. (Collins-FIRL)
W77-06141

A REFRESHER ON SODIUM HYPOCHLORITE.
Water and Pollution Control, Vol. 115, No. 1, p 11-12, January, 1977.

Descriptors: *Disinfection, *Odor, *Waste water treatment, *Water quality, Sewerage, Reservoirs, Treatment facilities, Chemical properties, Physical properties, Industrial wastes.

Hypochlorite, long used as a textile bleach, has found its way into water treatment and sewage plants as a disinfectant. It is used as an odor control agent and disinfectant in filtration plants, wells, reservoirs, new watermains, and waste water treatment facilities. It is simple, safe, easy to use, and it does not change from liquid to gas during use. It requires no preparation for use and the dosage can be added manually or automatically. Only a storage tank and metering pump are necessary. It has similar performance characteristics with chlorine. It is convenient and economical for drinking water treatment and is often substituted for chlorine because of its safety in use. The usual dosage is 0.2 to 0.6 ppm available chlorine. The quantity of hypochlorite needed is largely dependent on the amount of chlorine needed for water treatment. In waste water treatment, hypochlorite can be added at any point in treatment, depending on the type of treatment facility. It can be used as a pretreatment for odor control. In industrial applications, no corrosion is probable if a satisfactory pH for the water is maintained. To remove odor from air, hypochlorite is exposed to the odorous air and the offensive components are oxidized. (Collins-FIRL)
W77-06142

NEW YORK CITY AREA EXAMINES ALTERNATIVE TO OCEAN DUMPING.
For primary bibliographic entry see Field 5E.
W77-06143

WATER PLANT PLANS ZERO DISCHARGE,
Havens and Emerson Ltd., Saddle Brook, N.J.
G. Vasilik, and P. W. Doe.
Water and Wastes Engineering, Vol. 13, No. 11, p 67-68, 70-71, November, 1976.

Descriptors: *Treatment facilities, Engineering, *Sewage treatment, *Sludge disposal, *Sludge treatment, Environmental control, Ultimate disposal, Lime, Hydraulic equipment, Filtration, *Waste water treatment.
Identifiers: Clifton(NJ), *Passaic River(NJ), Zero discharge.

The Passaic Valley Water Commission treatment plant in Clifton, New Jersey, was built to achieve the goal of zero discharge by 1985. The elimination of discharge into the Passaic River has been achieved by thickening and filter pressing sludges, which are then disposed of in landfills. Liquid products are returned to the treatment plant inlet or used for internal purposes in the sludge disposal system. The facility is flexible relative to the quality and quantity of sludge to be processed. The sedimentation basins have variable rate sludge pumps, for example. There are two independent sludge processing systems for continuous plant operation. The plant is centrally located and designed to use a minimum of land. The second level of the sludge press building is acrylic walled to allow public view of the sludge processes and control panel. The facilities were designed to be compatible with present treatment equipment and processes. Engineering and construction data are described. (Collins-FIRL)
W77-06144

AUSTENITIC STAINLESS STEELS AND TITANIUM FOR WET AIR OXIDATION OF SEWAGE SLUDGE,
Zimpro Inc., Rothschild, Wis.
T. P. Oettinger, and M. G. Fontana.
Materials Performance, Vol. 15, No. 11, p 29-35, November, 1976. 13 fig, 5 tab, 8 ref.

Descriptors: *Sludge treatment, *Oxidation, *Treatment facilities, *Structural analysis, *Stainless steel, *Titanium, Metals, Air, Domestic wastes, *Sewage treatment, Sewage sludge.
Identifiers: *Wet air oxidation, *Titanium.

Austenitic stainless steel and titanium were investigated as construction materials for sludge wet air oxidation (WAO) facilities. Conclusions were based on a five-year data collection from thirty sewage treatment plants. It was found that stainless steel (Types 304 and 316) could be used in WAO of domestic sewage sludge with chloride concentrations up to 400 mg/liter at 177-288 C. Individual evaluations must be made of sludges with a high industrial/domestic sewage input ratio, or those subject to factors which substantially affect overall composition, regardless of chloride content. When exposed to sludges with more than 400 to 600 mg/liter chloride concentrations, stainless steel was subject to pitting. Titanium resisted damage at chloride levels of 3000 mg/liter at 204 C. There was no sign of corrosion with titanium under these conditions. Results of the study should not be extrapolated to wastes other than domestic sewage sludge. (Collins-FIRL)
W77-06145

SIMULTANEOUS INCINERATION OF REFUSE AND SEWAGE SLUDGE: THE PRINCIPLES AND APPLICATION AT BOWHOUSE, ALLOA, SCOTLAND,
Babtie, Shaw and Morton, Glasgow (Scotland).
For primary bibliographic entry see Field 5E.
W77-06147

FRESNO ADOPTS 'OUTSTANDING' MANAGEMENT PLAN,
Jenks and Harrison, Palo Alto, Calif.
J. J. Jenks, and B. M. Wyckoff.
Water and Wastes Engineering, Vol. 13, No. 11, p 39-41, November, 1976.

Descriptors: *Water management(Applied), *Waste water treatment, Industrial wastes, Municipal wastes, Treatment facilities, Water reuse, Groundwater, Domestic wastes, Activated sludge, Engineering, Irrigation, *California.
Identifiers: Fresno(Calif).

The City of Fresno, California, instituted an integrated water supply and waste water management program. The program meets water pollution control requirements, potable water augmentation needs, irrigation supply and groundwater resource protection requirements. It also solves the problem of wine industry waste treatment and

disposal. Cost-effectiveness was achieved by combining two primary waste water treatment facilities into a secondary treatment plant. A separate industrial waste transport and treatment facility handles wine industry wastes. Infiltration beds of 2,000 acres are used for agriculture and disposal of waste water on land. Twenty-one extraction wells ultimately pump discharge into an irrigation system. Relevant engineering and construction information was presented. (Collins-FIRL)
W77-06148

AUSTRALIA MAKES IMPRESSIVE PROGRESS IN POLLUTION ABATEMENT.
For primary bibliographic entry see Field 5G.
W77-06149

NO BYPASS, ZERO DISCHARGE, PLANT PROTECTS MAUI COASTLINE,
CH2M/Hill, Inc., Portland, Oreg. Treatment Systems Dept.
G. Koblitz.
Water and Wastes Engineering, Vol. 13, No. 11, p 31-36, November, 1976. 1 fig, 3 tab.

Descriptors: *Treatment facilities, *Sewage treatment, Pollution abatement, *Waste water treatment, Sludge treatment, Sludge disposal, Irrigation, Activated sludge, *Water reuse, Design criteria, *Hawaii, Recycling.
Identifiers: *Zero discharge, *No bypass, Maui County(Hawaii).

No bypass and zero discharge were required by Maui County, Hawaii, to prevent potential water pollution and help solve chronic water supply problems along its coastline near Kihei. The extreme development of resorts and tourist attractions has made pollution a prime concern. An average of 12 inches of rainfall annually has limited water available for domestic and agricultural purposes. Limited funds also placed the requirement of inexpensive solutions in the forefront. The answer was found in a 4.0 mgd waste water collection and water reclamation system built with State and local monies. It was the first large-scale activated sludge waste water reclamation facility. It employs innovative plant design, ranchland, and parkland irrigation for effluent disposal. The activated sludge process, eliminating primary clarifiers and aerobic digestion without thickening, is used to prepare organic solids for soil conditioning and fertilizing. Life-time savings over a conventional activated sludge system with primary clarification and anaerobic digestion is estimated to be $50,000. Maximum reliability and capability were ensured by dual units and standby capacity. Two parallel flow streams are employed with the capacity for flow routing between major units at all points. A waste water/crop management program which demonstrates the use of treated effluents was provided on leased ranchland. There is a capacity for irrigating 400 acres, and up to 250,000 gpd of plant effluent receives additional treatment by mixed-media pressure filter to prepare it for parkland irrigation. (Collins-FIRL)
W77-06151

NEW SYSTEM PROVIDES FOR GROWTH,
Meyer, Meyer, LaCroix and Hixson, Alexandria, La.
J. L. Meyer, B. G. Scalf, and J. T. Walker.
Water and Wastes Engineering, Vol. 14, No. 1, p 28, 31, 49, January, 1977. 3 fig.

Descriptors: *Treatment facilities, *Sewage treatment, Construction, Sludge treatment, Pollution abatement, *Waste water treatment, Costs, Design criteria, Economics, *Louisiana, *Biochemical oxygen demand, *Suspended solids.
Identifiers: Alexandria(LA).

A new sewerage system in Alexandria, Louisiana, is economical and reduces BOD and suspended solids concentrations below state and federal standards. An engineering study recommended a system with adequate growth capacity for a 20-year period that would meet present and future pollution control requirements, that was economical, and that was simple to operate. Economies were made by using existing collection system and lift stations where possible and by using one as the major delivery station for sewage to the treatment site. Two new lift stations were constructed and three existing ones were modified. A 14 mgd treatment plant was built consisting of a grit and grease removal unit, primary aeration cells, clarifiers, secondary aeration cells, wet weather storage lagoons, chlorination facilities and an administration and laboratory building. All sludge is recirculated to the head of the plant, eliminating sludge handling or disposal equipment. Endogenous respiration is calculated to help reduce sludge buildup. Liquid alum feed facilities introduce the alum to the influent well of the clarifiers without mechanical mixing or flocculation. The project cost was about $10.3 million. (Collins-FIRL)
W77-06152

EARTH, FIRE AND SLUDGE,
For primary bibliographic entry see Field 5E.
W77-06153

SLUDGE IN A STATE OF PURITY,
The Consulting Engineer, Vol. 40, No. 12, p 38-39, December, 1976. 2 fig.

Descriptors: *Sludge treatment, *Irradiation, *Sludge disposal, Bacteria, Viruses, Animal parasites, Fertilizers, Sewage treatment, *Waste water treatment, Pilot plants.

The original intent of sewage purification was to use the treated sewage as fertilizer. The practice has been to treat sewage for disposal but, with improved processes, especially the irradiation of sewage sludge, modern practice may include this alternative. Irradiation, or irradiation combined with heat, can destroy bacteria, viruses, and parasites which are present in raw sewage sludge. Composting is presently the most viable process involving irradiation because the irradiation can be added as a final stage. Recent experiments indicated that irradiation at 300 krads was able to reduce fecal streptococcus bacteria by about two logs; reduce coliform bacteria by 10 logs; reduce viable parasitic ova by 4 logs at a minimum; reduce viruses by one log; and improve settling and filtration by a factor of three. A pilot plant to study the process was proposed for Albuquerque, New Mexico. It was suggested that irradiation could, at relatively low doses (less than 1 Mrad), ensure a sterilized, commercially marketable compost. At a pilot plant near Munich, Germany, irradiation has proven successful. Results with a mean dose of 300 krad for 210 minutes were the same as heat sterilization at 80C for 30 minutes. (Collins-FIRL)
W77-06154

STUDY OF THE OXYGEN DEMAND IN BIOLOGICAL WASTE WATER TREATMENT AND INCINERATION PROCESSES (VALUTAZIONE DELL'02 CONSUMATO NEI PROCESSI BIOLOGICI DI TRATTAMENTO ACQUE NEI PROCESSAI DI INCENERIMENTO),
M. Falleni, and M. Ottaviani.
Rassegna Chimica, Vol. 28, No. 3, p 101-105, May-June, 1976. 3 fig, 11 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Oxygen demand, Sludge treatment, Biodegradation, *Chemical oxygen demand, *Biological oxygen demand, Oxidation, Acidity, Alkalinity, Incineration.

In a traditional biological waste water treatment plant, optimal purification is achieved when O2 is supplied to the system as fast as it is being consumed. The total consumption of O2 is equal to the quantity of BOD used to provide the reaction with energy, the quantity of BOD eliminated, the speed of endogenic respiration, and the quantity of sludge. In total oxidation systems where the sludge is incinerated, it is necessary to know the composition of the sludge in order to determine the O2 necessary for combustion. COD gives the content of biodegradable and non-biodegradable substances in the sludge as well as of all substances capable of oxidation with K2Cr207 in an acid environment (H2SO4). As a rule, BOD is about 52% of COD. (Waltner-FIRL)
W77-06155

OPTIMIZING COSTS OF WASTE TREATMENT FACILITIES USING VALUE ANALYSIS,
Smith, Hinchman and Grylls Associates, Inc., Detroit, Mich.
A. J. Dell'Isola, and J. Truhan.
Consulting Engineer, Vol. 47, No. 6, p 55-58, December, 1976. 2 fig, 1 tab.

Descriptors: *Treatment facilities, *Cost analysis, *Cost-benefit analysis, Initial costs, Maintenance costs, Operating costs, Replacement costs, Alternative costs, Bids, Waste water treatment, Economics, Decision making, *Optimization.
Identifiers: Value analysis, Life-cycle costing, *Cost optimization.

Value analysis is a means of determining the necessary effort and scheduling and budgeting of funds for the most effective operation of a waste treatment plant. It is designed to eliminate, as well as to identify unnecessary costs. The analytical process involves several steps. The item is selected; the owner/designer reviews results and implements approved alternatives. The review includes analysis by an interdisciplinary team to determine possible areas of significant cost savings. The designer's estimate or bidder's cost is balanced against the least cost alternative which performs the same function. The process was applied to the design of an Ocean County (N.J.) treatment facility. Areas of greatest potential savings included liquid structures, equipment structures, pumping and piping, and electrical distribution. Savings in the structures category focused on digester tanks and final clarifiers. Construction methods and materials were the object of pumping and piping evaluations. In the last category, savings in lighting, switchgear, and underground distribution were investigated. With this plant, a savings of $697,000 was effected. Value analysis proved itself to be a valuable aid in cost savings when applied to waste water treatment. (Collins-FIRL)
W77-06156

FACTORS INVOLVED IN BIOCHEMICAL OXIDATION OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol. 16, No. 11, p 574-575, November, 1976. 2 tab, 9 ref.

Descriptors: *Oxidation, *Nitrification, *Biochemical oxygen demand, *Oxygen, Microorganisms, Dissolved oxygen, Sewage effluents, Oxygen demand, Sewage treatment, Waste water treatment.
Identifiers: *Biochemical oxidation(Sewage).

The oxidizable matter in sewage is mainly carbonaceous and nitrogenous compounds. Biochemical oxidation takes place in two stages: oxidation of carbonaceous matter and oxidation of nitrogenous matter or nitrification. Various sewages are analyzed for dissolved oxygen absorbed by settled sewage during a 50-day period at 20 C and a 1/200 dilution with a small amount of nitrified filter effluent to avoid sporatic results in the second stage of oxidation. This suggested that few nitrifying organisms are present in untreated sewage. Evidence was provided to indicate that the second stage is entirely the result of oxidation

of nitrogenous matter. The presence of the second oxidation stage is suspected to be due to the activity of nitrifying organisms which prevents nitrification until carbonaceous oxidation is nearly complete. The need of oxygen is a characteristic feature of sewage and its strength is expressed in terms of the oxygen needed for oxidation. Evidence indicated that matter which is inert to biochemical oxidation is also removed during sewage treatment and that total oxygen demand of sewage and the reduction effected therein during treatment is the most realistic criteria of loading and performance of treatment plants. (Collins-FIRL)
W77-06157

KINETICS AND MECHANISM OF OXIDATION OF HYDROGEN SULFIDE BY HYDROGEN PEROXIDE IN ACIDIC SOLUTION,
Minnesota Univ. Minneapolis. Dept. of Civil and Mineral Engineering.
M. R. Hoffmann.
Environmental Science and Technology, Vol. 11, No. 1, p 61-66, January, 1977. 5 fig, 5 tab, 28 ref.

Descriptors: *Oxidation, *Hydrogen sulfide, *Kinetics, *Municipal wastes, *Industrial wastes, *Hydrogen ion concentration, *Sewage treatment, Odor, Corrosion, Waste water treatment, Sewerage.
Identifiers: *Hydrogen peroxide, *Odor treatment.

Hydrogen peroxide has recently received much backing as an odor treatment in municipal sewage treatment systems. These odor problems result from the production of H2S in treatment systems, in concrete sewer lines and other anaerobic environments where organic matter and sulfates are present. Oxidation of H2S by H202 is important because H2S also corrodes concrete sewer lines. Experimental results indicated that hydrogen peroxide under proper circumstances could be an effective reagent for the control of hydrogen sulfide and its odor. At a pH below 7.5, hydrogen sulfide and hydrosulfide ion are readily oxidized to a mixture of zero valent sulfur and sulfate with complete removal of the odor. A system which maximizes the production of elemental sulfur is desirable. H2S reacts in a mole ration of 1:1 and a higher mole ratio of sulfide to peroxide is needed when sulfate is produced. When the fraction of HS(-) in solution decreases, the reaction rate also decreases; thus, the optimal pH is near 7. A higher percentage of sulfate will form if excessive H2O2 is added to increase the reaction rate. A H2O2 dose that is twice the measured sulfide concentration is best for odor control. At a pH higher than 8, a greater dose of H2O2 is necessary because the predominant product is sulfate. A fourfold excess of peroxide is needed to complete the reaction. Hydrogen peroxide has the advantages of decomposition products of oxygen and water; it is a liquid and there are no toxic or corrosive fumes; and it is economically competitive with other treatment systems. (Collins-FIRL)
W77-06158

VOLUMETRIC DETERMINATION OF GREASE IN WASTEWATER,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5A.
W77-06160

VIRUS-COAL SORPTION INTERACTION,
Lalbhai Dalpatbhai Coll. of Engineering Ahmedabad (India). Dept. of Civil Engineering.
P. P. Oza, and M. Chaudhuri.
Journal of The Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE6, p 1255-1262, December, 1976. 6 fig, 1 tab, 24 ref, 1 append.

Descriptors: *Adsorption, *Desorption, *Viruses, *Coals, Sorption, Filtration, Hydrogen ion concentration, Hydrogen bonding, Temperature, Economics, Carbon, *Waste water treatment, Water treatment.
Identifiers: Bacterial virus MS2, Giridih bituminous coal.

Investigations were performed to determine the capacity of coal to absorb viruses. The model virus used was bacterial virus MS2 (MS2 phage). Giridih bituminous coal was pulverized and sieved to 300-425 microns, washed several times to remove fines, dried at 103 C, and stored in a desiccator for use. Batch sorption tests were carried out at various pH values in 0.2 M phosphate buffer. Samples were withdrawn, filtered through a Whatman paper disk soaked in 3% beef extract, and the filtrate was enumerated for unsorbed viruses. Desorption tests were done by eluting the sorbed viruses with 0.2 M phosphate and 3% beef extract on a rotary shaker. Sorption kinetics at pH 6.5, 7.1, and 8.0 revealed a net negative charge by MS2 phage and Giridih coal. Equilibrium sorption increased linearly with ionic strength. Desorption was not evident when phosphate buffer was the eluent. With 3% beef extract, 10% desorption occurred with rapid activity during the first 10 minutes. Low desorption suggests that viruses are strongly sorbed on coal. Sorption increased with rising temperatures. Shifting adsorption peaks indicated probable hydrogen bonding interactions. Sorption was studied with acetyl chloride-treated coal to determine these interactions. Coals with higher hydrogen content have a higher virus sorption. It was noted that viruses sorb only the exterior surface of the coal. Comparisons between active carbon and coal showed that the sorption capacity of coal was 50% that of active carbon; however, coupled with lower cost and recovery of fuel value after exhaustion, coal is a viable alternative for removing viruses from water. (Collins-FIRL)
W77-06162

PHOSPHORUS UPTAKE BY BIOLOGICAL SLIMES,
Marquette Univ., Milwaukee. Dept. of Civil Engineering.
A. E. Zanoni.
Journal of The Environmental Engineering Division, Proceedings of ASCE, Vol. 102, No. EE6, p 1229-1237, December, 1976. 2 fig, 4 tab, 14 ref.

Descriptors: *Biological treatment, *Phosphorus, *Slime, Adsorption, Carbon, Nitrogen, Chemical oxygen demand, *Waste water treatment, Ultraviolet radiation, Filtration, *Absorption.

A study was performed to determine whether there is excessive phosphorus uptake by biological slimes under normal conditions of filtration during waste treatment and to clarify the mechanism of soluble phosphorus uptake by biological slimes. A test channel apparatus with adjustable channel lengths on a channel plank with adjustable slope was used. Ultraviolet radiation was used to inactivate the surface slime to help establish the degree of physical adsorption involved. The feed substrate consisted of 25 grams dry milk solids, 75 grams glucose, 15 milliliters Na2HPO4 solution, and 80 milliliters NH4Cl solution added to 80 liters softened, dechlorinated Milwaukee tap water. A substrate with a high carbon:phosphorus ratio was needed to obtain a resonable phosphorus removal sensitivity. Testing revealed that measurable amounts of soluble phosphorus, COD, and nitrogen are removed by the slime surface and these removals are proportionate to the channel length. A slime phosphorus content of 1.62% to 2.57% shows that excessive phosphorus uptake had not occurred under a variety of operating conditions. A phosphorus removal of less than 20% can be expected in municipal waste water treatment and chemicals must be added to increase phosphorus removals. The tests involving UV treatment suggest that phosphorus uptake by a slime surface is not due to physical adsorption, and that it was totally due to a biochemical mechanism. (Collins-FIRL)
W77-06163

THE KINETICS OF BIOOXIDATION IN A CONTINUOUS ACTIVATED SLUDGE PROCESS (KINETYKA PROCESU CIAGLEGO BIOUTLENIANIA OSADEM CZYNNYM),
Politechnika Slaska, Gliwice (Poland).
J. Suschka.
Zeszyty Naukowe Politechniki Slaskiej- Inzynieria Sanitarna, Vol. 20, No. 483, p 1-69, 1976. 38 fig, 16 tab, 59 ref.

Descriptors: *Sludge treatment, *Laboratory tests, *Kinetics, *Oxidation, *Activated sludge, *Biochemistry, *Waste water treatment, Biochemical oxygen demand, Equations.
Identifiers: Substrate oxidation, Continuous activated sludge process, Biooxidation.

Experiments indicated a need to alter interpretations of the kinetics of substrate oxidation in a continuous activated sludge system. In such a system, the controlling factor in the biochemical reaction rate should be the rate of substrate supply. Thus, the reaction rate would be relative to the activated sludge load. A laboratory-scale pilot investigation and full-scale test were performed with different waste waters. The k rate was observed to increase with increased activated sludge loading and was confirmed by respirometric measurements. An equation was presented to show the relationship between increased sludge activity, the biochemical reaction rate, and substrate concentrations for various waste waters. This equation was valid in conventional and high activated sludge load ranges, above 0.15 grams of BOD5/gd. The equation was proven applicable in calculating substrate biochemical oxidation rates in continuous activated sludge systems. (Collins-FIRL)
W77-06166

EFFECTS OF DOSING RATES ON TRICKLING FILTER PERFORMANCE,
Southern Illinois Univ., Carbondale. Dept. of Thermal and Environmental Engineering.
E. E. Cook, and L. Crame.
Journal Water Pollution Control Federation, Vol. 48, No. 12, p 2723-2730, December, 1976. 3 fig, 1 tab, 19 ref.

Descriptors: *Trickling filters, *Biological treatment, Physical properties, Waste treatment, Chemical oxygen demand, Biochemical oxygen demand, Microorganisms, Kinetics, Biomass, *Waste water treatment, *Filters, *Filtration.

The performance of trickling filters is examined to determine the effects of the frequency with which waste is distributed over the filter media. A model fixed bed reactor was used with a prepared synthetic waste with sucrose as the limiting substrate for bacterial growth. Nutrients were added to provide a balanced growth medium. The pH of the synthetic waste at the distributor nozzle was 7.0 to 7.5. Results indicated that increasing the rest periods between dosing caused an increase in the instantaneous hydraulic load to the filter and altered COD removal kinetics. The higher instantaneous loadings changed COD removal from two first-order rates to a single rate throughout the filter. Continuous dosing provided a great COD removal in the upper filter regions, but retarded COD removal in the lower levels. A 5-minute dosing period with a 5-minute rest period was considered best for a deep trickling filter. These results were not applicable to a circular trickling filter with rotating distributors due to the difference in filter geometry. A change in detention time by increased instantaneous hydraulic loading caused no substantial difference in effluent quality. It was thought that increased rest periods between dosings caused the biomass to grow distribution of biomass in the trickling filter. It was

concluded that continuous dosing was best for shallow trickling filters and that the above dosing plan was best for deep trickling filters. (Collins-FIRL)
W77-06167

PROCESS CONTROL AND DATA PROCESSING IN SEWAGE TREATMENT PLANTS,
J. Lenschow.
Brown Boveri Review, Vol. 63, No. 10, p 643-650, October, 1976. 12 fig, 8 ref.

Descriptors: *Automatic control, *Data processing, *Treatment facilities, *Instrumentation, Biological treatment, Sludge treatment, Measurement, Waste water treatment, Operating costs, Treatment, Computers.

Automated control and data processing have recently been used to reduce costs and personnel work loads, as well as to increase safety and sewage purification levels. Examples were given to illustrate the beneficial use of data processing and automated control on mechanical purification, biological purification and sludge treatment. The combination of purification processes and the growing development of reliable measurement instrumentation have made this a viable part of waste water treatment. Automated process control makes it possible to optimize purification performance and increase the flexibility of plant operations. (Collins-FIRL)
W77-06168

COMPUTER CONTROLS 55,000 CU M/DAY OF SEWAGE.
Control and Instrumentation, Vol. 8, No. 8, p 10, September, 1976.

Descriptors: *Automatic control, *Computers, Waste water treatment, *Biological treatment, Sludge digestion, *Treatment facilities, Aeration, Oxidation, Flow, Activated sludge, Filtration.
Identifiers: Whitlingham(UK).

Computer controls have been installed at the Anglian Water Authority's Whitlingham, England, sewage treatment plant. The system allows remote automatic control of most of the treatment process, traditional biological filter treatment, and the activated sludge processes. The control loops for the activated sludge process are a good example of the sophistication provided by the system. A control flow of settled sewage is passed through a series of aeration tanks where air is blown into the mixed liquor to speed the oxidation process. The balance of flow rate, sludge return and oxygen level is maintained automatically and involves measurement and control of flow rate and dissolved oxygen levels. A semi-high level sequencing language was used to develop override capability in instances of electrical or mechanical failures or storms. The inlet screen, flow splitting, aeration channels, sequence switching of pumps for recirculation or double filtration, batch feeding, and monitoring of anaerobic sludge digestion are controlled. Operators can up-date set points, retrieve data on demand and initiate various control strategies while the system is functioning. There is also a provision for manual control. (Collins-FIRL)
W77-06169

AN EXAMINATION OF THE VALIDITY OF THE MATHEMATICAL FORMULAE FOR EXPRESSING THE RATE OF BIOCHEMICAL OXIDATION OF SEWAGE,
T. Stones.
Water Pollution Control, Vol 75, No 4, p 527-529, 1976. 4 tab, 8 ref.

Descriptors: *Mathematical models, *Oxidation, Analysis, *Biochemical oxygen demand, *Waste water treatment, *Sewage treatment, Dissolved oxygen, Domestic wastes, Chemical reactions, Evaluation, Biological treatment.
Identifiers: Phelps' Law, *Biological oxidation(Sewage).

Conclusions based on results of investigations by Streeter and Phelps indicate that the rate of biochemical oxidation of carbonaceous matter in sewage is proportional to the remaining concentration of carbonaceous matter measured by its unsatisfied BOD, and that the process is in accord with a first-order reaction previously postulated by Phelps. Various aspects of this conclusion were evaluated. Several investigations have shown that biochemical oxidation of carbonaceous matter did not conform to the postulated reaction. This discrepancy has been ascribed to the heterogeneous nature of sewage that causes more readily oxidized constituents to be attached first so that the proportion of constitutents resistant to oxidation increases and the velocity coefficient decreases as oxidation continues. If Phelps' Law is modified to assume a retardation factor so that the velocity coefficient is not constant but decreases progressively with time, constant figures should be obtainable. Values for initial velocity coefficient and the retardation factor could then be calculated. These figures were not constant and it was shown that the reaction did not proceed in accordance with the retarded exponential equation. Further calculations, assuming that oxidation is governed by unsatified BOD and the residual concentration of DO, resulted in a process which conformed to a second order reaction. It was concluded that the oxidation rate at any time in a period of 10 days is governed jointly by residual concentrations of DO and the unsatisfied BOD. (Collins-FIRL)
W77-06170

PHYSICAL AND ECONOMIC PARAMETERS FOR PLANNING REGIONAL WASTE WATER TREATMENT SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
S. L. Klemetson, and W. J. Grenney.
Journal Water Pollution Control Federation, Vol 48, No 12, p 2690-2699, December, 1976. 6 fig, 7 tab, 27 ref.

Descriptors: *Model studies, *Mathematical models, *Computer models, Treatment facilities, Waste water treatment, Treatment, Water quality, Community development, Human population, Economics, Regional analysis, Planning.
Identifiers: Regional planning.

Parameters were developed for the operation of a mathematical model to be used in regional planning for treatment systems. Parameters considered were: population projections, waste water quality and quantity, stream and effluent standards, pollution removal efficiencies, treatment level classifications, cost indices, interest rates, economies of scale and cost coefficients for capital and operation, and maintenance costs. Data was calculated or obtained from available literature and summarized in the desired formats. (Collins-FIRL)
W77-06171

EFFECT OF A SECONDARY TREATED EFFLUENT ON THE MOVEMENT OF VIRUSES THROUGH A CYPRESS DOME SOIL,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-06173

SEPTIC TANK POLLUTION CUT.
Corps and Soils, Vol 29, No 3, p 14, December, 1976.

Descriptors: *Septic tanks, *Water pollution, *Dentrification, *Groundwater, Nitrates, Nitrogen, Laboratory tests, On-site tests, Prototype tests, Anaerobic conditions, Pulp wastes.
Identifiers: Limestone columns, Methanol.

Design elements of a denitrification unit for nitrates from septic systems were considered. These nitrates are contributors to groundwater pollution. The nitrates are changed into nitrogen gas by the process. Necessary components of the system are the absence of oxygen and the presence of an energy source. In this system, sewage effluent with nitrates flow continuously through limestone-filled columns, simulating the continuous flow in a field septic system and creating anaerobic conditions. Methanol is used for the energy source and is used in the bacteria's biochemical process to change nitrates into nitrogen gas. Sludge from paper mills was suggested as a cheap energy source if it were not proved to be a pollution source. The nitrogen gas produced is discharged into the air. Initial tests of a field unit indicate efficiencies near that produced in the laboratory. (Collins-FIRL)
W77-06174

EFFECTS OF SEWAGE SLUDGE COMPOSITION, APPLICATION RATE, AND LIME REGIME ON PLANT AVAILABILITY OF HEAVY METALS,
Department of the Environment, Ottawa (Ontario). Office of the Science Advisor.
For primary bibliographic entry see Field 5C.
W77-06175

PROCESS TECHNOLOGICAL BACKGROUND REGARDING NEW PROTECTIVE REGULATIONS OF WATER BODIES-RESULTS OF NITRIFICATION AND PHOSPHORUS ELIMINATION EXPERIMENTS IN ZURICH AND BERN. I. INTRODUCTION AND FUTURE PROSPECTS OF PROTECTIVE PLANNING (VERFAHRENS-TECHNISCHE UNTERLAGEN IM HINBLICK AUF DIE NEUEN GEWAESSERSCHUTZ-ANFORDERUNGEN-ERGEBNISSE DER VERSUCHE UEBER DIE NITRIFIKATION UND PHOSPHORELIMINATION IN ZUERICH UND BERN. I. EINFUEHRUNG UND PERSPEKTIVE IM HINBLICK AUF DIE GEWAESSERSCHUTZ-PLANUNG),
P. Roberts.
Gas-Wasser-Abwasser, Vol. 56, No. 11, p 604-608, 1976. 5 fig, 4 tab.

Descriptors: *Regulation, *Design criteria, *Treatment facilities, Evaluation, Water quality, Effluents, Water pollution sources, Waste water treatment, Industrial wastes, Water quality standards, Adsorption, Activated carbon, Filtration, Ammonia, Phosphorus, Chemical precipitation.
Identifiers: *Switzerland(Waste regulations).

Swiss waste water discharge regulations of December, 1975, require new measures in waste water treatment practices. Older criteria for design which rely heavily upon BOD removal and suspended solids must be adapted to new effluent standards, and parameters, such as ammonia, phosphorus, and dissolved carbon, must be considered when designing new treatment facilities. The critical parameters from the viewpoint of maintaining the desired status of the body of water differ depending on the type of water (running water or lake) and the type of impairment expected, given the intended use of the water. Residual concentrations of DOC (dissolved organic carbon) are reduced 10% by simulation precipitation and filtration, 20% by additional contact filtration, and 30% by preliminary precipitation. Activated carbon adsorption affords a possibility of attaining an effluent concentration of 2 milligrams/liter, or less, of DOC. Problems involving metals generally arise from local industrial sources and should be eliminated there. Necessary design principles can be derived from pilot and full-scale investigations of modern processes or combinations of processes. (Collins-FIRL)
W77-06182

EVALUATION OF GAUZE PAD METHOD TO RECOVER VIRUSES FROM WATER,
Hadassah Medical School, Jerusalem (Israel).
For primary bibliographic entry see Field 5A.
W77-06183

ALGAE SEPARATION FROM OXIDATION POND EFFLUENTS,
Tennessee Technological Univ., Cookesville. Dept. of Civil Engineering.
A. A. Friedman, D. A. Peaks, and R. L. Nichols.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 111-119, January, 1977. 8 fig, 2 tab, 12 ref.

Descriptors: *Algal control, *Oxidation lagoons, *Oxygen demand, *Chemical oxygen demand, Water purification, Waste water treatment, Sewage effluents, Sedimentation, Flotation, Lime, Polyelectrolytes, Magnesium hydroxide, Coagulation, *Separation techniques.
Identifiers: Alum.

Analysis of maturation and facultative lagoon effluents have indicated that algae in effluents produce a great oxygen demand on receiving waters. A study was conducted to evaluate and characterize methods of algae removal from waste water treatment systems. A laboratory-grown algae sample was studiedie using coagulants, pH values, and algal concentrations for bench-scale batch flotation and sedimentation tests. Field studies were also conducted. Data resulting from these studies indicated that magnesium must be present if lime was to become an effective algae removal agent and lime raises pH which allowed the precipitation of magnesium hydroxide. The addition of 10 milligrams/liter of magnesium at pH 11 was sufficient to remove waste water grown algae by sedimentation or dissolved-air flotation processes. In a pH range of 5 to 9, alum was an effective coagulant for algae removal in these experiments. Synthetic organic polyelectrolytes were not effective algae coagulants either with or without lime or alum treatment. Because supernatant COD quality is not degraded for periods longer than 90 days, periodic in-pond separation of algae by chemical coagulation and sedimentation seems viable. (Collins-FIRL)
W77-06184

PURIFICATION OF WASTE SULPHURIC ACID BY DIALYSIS ON WEAKLY-BASIC ANION-EXCHANGE MEMBRANES (DIALITYCZNE OCZYSZCZANIE ODPAWDOW STEZONEGO KWASU SIARKOWEGO PRZY POMOCY SLABOZASADOWYCH MEMBRAN ANIONOWYMIENNYCH),
A. Mika-Gibala, and T. Winnicki.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 1-10. 3 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Sulfur compounds, Organic compounds, Acids, Degradation, *Anion exchange, Neutralization, Hydrogen, Ion exchange, Membrane processes, *Dialysis.
Identifiers: Ion-exchange membranes, Selemion DMT membrane.

Studies were conducted to determine more economic means of neutralizing sulfuric acid wastes formed during sulfonation of organic compounds. Purification by dialysis was investigated. The test solution contained about 13 moles/cu dm of H_2SO_4 and up to 200 grams/cu dm of organic impurities, the post-sulfonation degradation products of iso-butyl naphthalene. Weakly-basic, anion-exchange membranes were used because of their superiority in relation to the specific mechanisms of hydrogen ion transfer. Determinations were made of the diffusion coefficient and rate of dialysis for ion-exchange membranes of varying capacities. Results indicated that these membranes were substantially better than the Selemion DMT membrane. (Collins-FIRL)
W77-06186

MEMBRANE SCALING PREVENTION IN AN ELECTRODIALYSIS DESALINATION OF BRACKISH WATER (ZAPOBIENGANIE POWSTAWANIU KAMIENIA MEMBRANOWEGO PODCZAS ELEKTRODIALIZY WOD SLONAWYCH),
For primary bibliographic entry see Field 3A.
W77-06187

EFFECT OF PH ON SOME WATER TREATMENT UNIT PROCESSES (WPLYW ODCZYNU NA NIEKTORE PROCESY OCZYSZCZANIA WODY),
A. L. Kowal, and J. Mackiewicz.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 32-37. 5 fig.

Descriptors: *Treatment facilities, *Water treatment, *Waste water treatment, Water purification, Water temperature, *Hydrogen ion concentration, Chlorination, Filtration, Rivers.

The efficiencies of purification processes are affected by pH levels of the treated waters. In water from the river Odra, optimum pH for alum coagulation and filtration was from 5.2 to 5.5, though the raw water pH was 7.4 to 7.8. A relationship was found between optimum pH of alum coagulation and water temperature. Water pH and the presence of manganese oxides on the filter bed sand determine the efficacy of iron and manganese removal. Manganese removal at a lower water pH can be achieved by preliminary chlorination. A pH of 7.0 allowed the most efficient sorption process with active carbon. (Collins-FIRL)
W77-06189

REMOVAL OF LEAD IN WATER TREATMENT (BADANIA NAD USUWANIEM OLOWIU Z WOD),
L. Kowal, and M. Swiderska-Broz.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 38-43. 3 fig.

Descriptors: *Waste water treatment, *Lead, *Activated carbon, Hydrogen ion concentration, Filtration, Adsorption, Suspended solids, Iron, Coagulation, Water treatment.

Studies were conducted of lead removal in water treatment processes. Lead sorptions on activated carbon and suspensions of clay, chemical coagulation, and filtration were investigated. Test solutions containing lead (from 0.1 to 1.0 ppm Pb up to 67.0 ppm Pb) were analyzed by atomic absorption. The processes studied were affected by lead concentration, water pH, coagulants applied and their doses, and the methods for removing suspended solids. The introduction of iron coagulation and filtration produced the best results. (Collins-FIRL)
W77-06190

POLYELECTROLYTES FILTER BED COATINGS (IMPREGNACJA ZLOZ FILTRACYJNYCH POLIELEKTROLITAMI),
B. Dziegielewski, A. L. Kowal, and J. Mackiewicz.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie Sklodowska University, Lublin, Vol. 1, p 59-68, 8 fig, 7 ref.

Descriptors: *Filtration, *Waste water treatment, *Poyelectrolytes, Coagulation, Suspended solids, Color, Cations, Anions.
Identifiers: *Filter bed coatings, Polyhall 650, Calgon M-502.

Filter bed coating with polyelectrolytes increases filtration efficiency in decoloring water with low suspended matter concentrations. Cationic and anionic polyelectrolytes were studied. During the first two hours of a 10-14 hour filter run, 0.1-0.2 ppm doses were applied. Raw water turbidity was 25 ppm; that of the effluent was less than 3 ppm. Filtration velocity was 7.5 meters/hour and the filter bed capacity for suspended solids was 1.95-2.85 kilograms/square meter. Anionic polyelectrolyte, Polyhll 650 proved most efficient at doses around 0.01 ppm. Calgon M-502 was very efficient with jar test coagulation, but useless for filter coating. Filtration effectiveness was increased by filter bed coating without prior coagulation. (Collins-FIRL)
W77-06192

REMOVAL OF CR(+6) FROM POTABLE WATER BY ION EXCHANGE (USUWANIE ZWIAZKOW CR(+6) Z WODY PITNEJ ZA POMOCA WYMIANY JONOWEJ),
For primary bibliographic entry see Field 5F.
W77-06193

DESIGN PRINCIPLES OF ACTIVATED CARBON-FILLED ADSORPTION COLUMNS FOR WASTE WATER TREATMENT (ZASADY PROJEKTOWANIA KOLUMN SORPCYJNYCH Z WEGLEM AKTYWNYM DO OCZYSZANIA SCIEKOW),
W. Adamski, and J. Przewlocki.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 105-119, 5 fig, 1 tab, 8 ref.

Descriptors: *Model studies, *Waste water treatment, *Adsorption, *Activated carbon, Biochemical oxygen demand, Chemical oxygen demand, Flow, Carbon, Mathematical models, *Design criteria.
Identifiers: Michaels' formula, Linear Bohart-Adams equation, Total organic carbon.

A formula was derived as an adsorber designing method. It was based on a mathematical model of sorbate balance. The parameters involved include the necessary adsorbent mass, waste water flow, mass transfer coefficient, surface area of adsorbent, and sorbate effluent and equilibrium concentrations. Activated carbon(s) surface area was determined from BET adsorption isotherms of p-cresol. A solution was developed to assess adsorption driving force and operating line COD, BOD, and TOC adsorption isotherms by use of the batch procedure. The mass transfer coefficient was determined through dynamic adsorption tests using column adsorbers filled with granular activated carbon. The extent of the adsorption front was derived from column breakthrough curves based on Michaels' formula. The linear Bohart-Adams equation was used to determine the k-value. (Collins-FIRL)
W77-06194

PROCESSING OF COMBINED DOMESTIC BATH AND LAUNDRY WASTE WATERS FOR REUSE AS COMMODE FLUSHING WATER,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
W. D. Hypes, C. E. Batten, and J. R. Wilkins.
Technical Report NASA TN D-7937, October, 1975. 66 p, 9 fig, 18 tab, 4 ref.

Descriptors: *Waste water treatment, *Water reuse, *Waste water(Pollution), Physical properties, *Physicochemical properties, Absorption,

Aquatic microbiology, Testing, Water conservation.

Processes and system configurations for reclaiming combined bath and laundry waste waters for reuse as commode flush water were investigated experimentally. In the absence of applicable standards, processes and hardware were tested by comparing their relative ability to improve the chemical/physical and microbiological qualities of waste waters. Filtration by single-pass, 90 min recycle, and 120 min recycle flows through a diatomaceous earth cake filter was investigated. A 90 min recycle flow effectively removed particulates down to one micron in maximum dimension and improved other physicl characteristics to the extent that the filtered water was subjectively acceptable for reuse. Adsorption during single-pass and 90 min recycle flows through activated charcoal following filtration by diatomaceous earth was investigated as a further improvement. A 90 min recycle flow was more effective and noticeably reduced color, turbidity, and sudsing. Heating the waste water to 135 F and 145 F for 15, 30, and 45 min and chlorination at availble chlorine concentrations of one, 15, 10, and 25 mg/liter to reduce total organism counts were investigated. Coliform counts can be reduced to near zero by heating the water to 145 F for 30 min or chlorinating to 20 mg/liter. If additional processing is accomplished after the initial chlorination, subsequent chlorination to 10 mg/liter or less may be required. The volume of bath and laundry water from a typical family of four is significantly greater than the volume of water required for commode flushing when the shallow-trap commode is used. Collection-tank overflow and tank drainage to remove accumulated particulates may require a small volume of makeup tap water. The energy-use rate for the reclamation system using diatomaceous earth filtration and chlorine sterilization averaged 0.695 kWh/day. (Snyder-FIRL)
W77-06196

STUDY OF PHYSICAL, SETTLING, AND THICKENING CHARACTERISTICS OF A SLUDGE,
Western Interstate Commission for Higher Education, Portland, Oreg. Resources Development Internship Program.
M. H. Greene.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 231, Price codes: A03 in paper copy, A01 in microfiche. EPA Report, Corvallis, Oregon, August, 1974. 30 p, 11 fig, 2 tab, 13 ref.

Descriptors: *Analysis, *Physical properties, *Sewage sludge, Sludge treatment, Sedimentation, Flocculation, Specific gravity, Suspended solids, Sea water, Waste water treatment.
Identifiers: Nassau County(NY), Pycnometers, Sludge thickening, Alum.

The physical characteristics of sludge from the Nassau County Bay Park Sewage Treatment Plant on Long Island, New York, were analyzed. Specific gravity of the sludge, determined by pycnometer methodology, was about 1000 grams/cu cm (liquid phase) and 1.53 and 1.62 for solids in two different samples. Total solids concentrations in the two samples were 2.20% and 1.15%. Settling studies revealed that the rate of flocculation is the limiting process for settling speed in a well mixed suspension of sludge solids. Flocculation is dependent on collision and adhesion of particles after collision. Settling time for 40% of solids in a homogeneous suspension was inversely proportional to the initial suspended solids concentration raised to the 4/3 power. The addition of several test substances did not prove especially useful in sludge thickening. However, alum was, in special cases, beneficial in increasing solids concentration. Seawater could be effective in increasing sludge bulk specific gravity, but large amounts would be required. Mechanical methods for sludge thickening should be investigated. (Collins-FIRL)
W77-06197

WATER TREATMENT PLANT PROCESSES AND OPERATIONS,
Environmental Protection Agency, Philadelphia, Pa. Region III.
J. F. Manwaring, and R. G. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 137, Price codes: A05 in paper copy, A01 in microfiche. EPA Report 903/9-75-021, May, 1974. 74 p, 27 fig, 12 tab.

Descriptors: *Engineering education, *Training, Potable water, Publications, Technical writing, Sanitary engineering, *Waste water treatment, Sewage treatment, *Treatment facilities, Sewage effluents, *Water treatment.

A training manual for plant operators and regulatory personnel of drinking water treatment facilities was developed by the Environmental Protection Agency. Information, data, and various calculations are presented to aid treatment plant operation. Various aspects of treatment covered include: coagulation-flocculation, sedimentation, filtration, iron and manganese removal, taste and odor control, softening, fluoridation, disinfection, desalination, nitrate removal, corrosion control, and disposal of water treatment plant wastes. A problem set relating to practical problems of operation is also included. (Collins-FIRL)
W77-06198

EFFECTS OF WASTE DISCHARGES ON WATER QUALITY OF THE SOUTH PLATTE RIVER, DENVER METROPOLITAN AREA,
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 5A.
W77-06199

STORAGE OF WASTES FROM WATERCRAFT AND DISPOSAL AT SHORE FACILITIES,
General Dynamics Corp., Groton, Conn. Electric Boat Div.
S. Cohen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 116, Price codes: A04 in paper copy, A01 in microfiche. FWPCA Report, April, 1970. 67 p, 22 fig, 4 tab.

Descriptors: *Waste storage, *Storage requirements, *Boats, *Water pollution sources, Liquid wastes, Solid wastes, Sanitary engineering, Plumbing, Pollution abatement, Economics.

A program was established to determine the use of an impoundment system with disposal at a shore facility for commercial and recreational watercraft to control sanitary and galley wastes as a pollution source. A demonstration unit was built and installed on a commercial tugboat and evaluated for two months. Component performance, system effectiveness, equipment and installation costs, and system operating costs were determined and evaluated. The control devices increased effective capacity of a compact (120-gallon capacity) holding tank to acceptable levels. Seawater flushing was used for toilets and urinals, and specially designed sanitary flush control and galley sink volume control devices were used to accommodate the holding tank capacity. The tank is corrosion resistant and had a level sensing system, an odor controlled vent line, automatic flushing system, and high level alarm. Suction pump-out by a quick-connect deck fitting was used to transfer tank wastes to shore. Solid galley wastes were stored in a special trash compactor. Study results indicated moderately initial cost for equipment and installation, minimal operation and maintenance considerations, ease of use and psychological acceptance, freedom from odor, components small enough to fit through hatchways and doors, design compatible with many watercraft, and compatibility with many shore disposal techniques. (Collins-FIRL)
W77-06201

SUMMARY OF PLANT EVALUATION: CITY AND COUNTY OF DENVER'S NORTHSIDE WASTEWATER TREATMENT FACILITY, AUGUST-SEPTEMBER 1972.
Environmental Protection Agency, Denver, Colo. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 781, Price codes: A02 in paper copy, A01 in microfiche. EPA Report December, 1972. 18 p, 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Pollutant identification, *Treatment facilities, *Waste water(Pollution), *Sewage treatment, Industrial wastes, Waste treatment, *Colorado, Interstate rivers.
Identifiers: *North Platte River(Colo), *Denver area(Colo).

The Denver Northside Wastewater Treatment Plant was evaluated to determine whether it was being operated and maintained satisfactorily to achieve the best protection for the waters of the South Platte River. The plant follows a basically sound operational program that should routinely provide adequate treatment. It may be possible to improve present operations by changing the ratio of primary digesters to secondary digesters. Digestion may also be improved by increasing the concentration of solids removed from the primary clarifiers. Present sampling of plant influent is inadequate to describe the incoming waste load. Sampling is not proportional to incoming flow and supernatant liquor is included in the influent sample. The laboratory appeared to be generally well equipped and to provide reliable data. The preventive maintenance program was good. The quantity of waste discharged by the various industrial contributors to the system has been reduced. The capacity of the plant is not exactly known. Presently, bypassing is done at 130 MGD. (Snyder-FIRL)
W77-06202

WASTE WATER TREATMENT. AERATION OF WASTE WATER BY OXYGEN.
NATO Committee on the Challenges of Modern Society. Brussels(Belgium).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 397, Price codes: A06 in paper copy, A01 in microfiche. Report N. 31, January, 1973. 107 p, 26 fig, 10 tab, 10 ref.

Descriptors: *Waste water treatment, *Aeration, *Oxygen, *Sludge treatment, *Treatment facilities, *Aerobic treatment, Waste treatment, Economics, Activated sludge, Municipal wastes, Industrial wastes, Oxygenation.

Reports are presented from an expert workshop of the NATO Committee on the Challenges of Modern Society (CCMS). Results of various international test groups indicated that oxygen enriched air or industrial oxygen would be suitable for waste water treatment. Several advantages of aeration by pure oxygen were cited. Though the use of air entails the use of uneconomical amounts of energy, a high oxygen level can be maintained in aeration tanks with slightly more energy needed than to dissolve the feed gas. High oxygen levels allow increased sludge concentrations in aeration tanks impairing the specific removal efficiency of the sludge, producing a higher pollution load capacity per space unit. Use of industrial oxygen results in a waste gas that is about 1% that produced in conventional processes. Little additional machinery is needed for adjusting the gas feed to a wide range of varying loads with oxygen and less excess sludge and better sludge characteristics are also produced. An oxygen utilization of more than 90% was obtained in several tests.

The most likely instances of oxygen or oxygen enriched air appear to be with wastes having high organic loads of varying concentration, wastes with easily volatile components and tending to emit odors, and over-loading of existing plants in which local conditions preclude area extensions. Many questions on specific mechanics and characteristics remain to be studied. (See W77-06204 thru W77-06209) (Collins-FIRL)
W77-06203

THE USE OF INDUSTRIAL OXYGEN IN THE ACTIVATED SLUDGE PROCESS,
H. Liebmann, and K. Scherb.
In: Waste Water Treatment. Aeration of Waste Water by Oxygen, NATO Committee on the Challenges of Modern Society, January, 1973, Brussels, Belgium, p 5-17, 5 fig, 6 ref.

Descriptors: *Aeration, *Oxygen, *Activated sludge, *Sludge treatment, *Waste water treatment, Treatment facilities, Aerobic treatment, Energy, Industrial wastes, Waste treatment, Oxygenation.
Identifiers: *UNOX, *Oxygen activated sludge.

The Union Carbide system for the aeration of activated sludge, using industrial oxygen, was evaluated. It consists of a series of airtight sealed tanks. Oxygen is introduced into the gas chamber, at low pressure, in the first tank. Compressors then remove the oxygen and introduce it into the water-sludge mixture by the hollow shaft of an agitator. The oxygen diffuses through perforated pipes or filters, and is distributed in the water-sludge mixture by stirring paddles. Oxygen content decreases from stage to stage, being about 40-50% in the last. Oxygen escapes the last tank by an exhaust pipe. Processes which vary this procedure are mentioned. Energy requirements range between 0.2 and 0.4 kilowatt hours/kilogram of 02, depending on the process used. Oxygen aeration is not fundamentally different from conventional aeration. More than 90% of the oxygen can be utilized, which is much greater than conventional methods. Operation with very high sludge concentrations is possible and there is the advantage of reduced excess sludge formation in multi-stage plants. This process also appears to be a reliable means for treating industrial wastes with high organic load. (See also W77-06203) (Collins-FIRL)
W77-06204

THE PURIFICATION OF HIGHLY POLLUTED WASTE IN A TEST PLANT, USING PURE OXYGEN,
W. Hegemann.
In: Waste Water Treatment. Aeration of Waste Water by Oxygen, NATO Committee on the Challenges of Modern Society, January 1973, Brussels, Belgium, p 18-42, 5 fig, 4 tab, 4 ref.

Descriptors: *Aeration, *Oxygen, *Activated sludge, *Sludge treatment, *Waste water treatment, Treatment facilities, Aerobic treatment, Industrial wastes, Municipal wastes, Waste treatment, Oxygenation, Odor.
Identifiers: *Oxygen activated sludge.

Tests were conducted to determine optimum operating conditions for a plant treatment using pure oxygen to purify wastes. Results indicated that a sludge concentration of 5 grams/liter could be maintained with the oxygen aeration process. Sludge indices were much lower than 100 cu meters/gram and activated sludge thickened readily in the final settling tank. The amount of excess sludge produced was much lower than that in previous experiences. Oxygen consumption was much greater than in conventional processes. The characteristic odor of aeration plants was not found in either the sewage effluent or the waste gas. Smaller tanks could be used with this process, but their expense would not produce any cost savings. (See also W77-06203) (Collins-FIRL)
W77-06205

BIOLOGICAL PURIFICATION OF WASTE WATER, USING OXYGEN,
K. M. Wuppertal.
In: Waste Water Treatment. Aeration of Waste Water by Oxygen, NATO Committee on the Challenges of Modern Society, January, 1973, Brussels, Belgium, p 43-56, 8 fig, 3 tab.

Descriptors: *Aeration, *Oxygen, *Activated sludge, *Pilot plants, Treatment facilities, Aerobic treatment, Industrial wastes, Sludge treatment, Waste water treatment, Oxygenation, Odor.

Studies on waste water purification by pure oxygen were conducted at a pilot plant at Elberfeld, Germany. The test plant had two stages, each with its own secondary settling tank. The first stage consisted of four tanks and the second stage had two tanks. Results indicated that oxygenation had several advantages over conventional aeration. Because the pressure of pure oxygen is greater than atmospheric oxygen, there is a higher oxygen content in activated sludge tanks, allowing operation with higher sludge concentrations and loads. There is about 90% utilization of industrial oxygen, and the remaining waste gas contains about 50% oxygen. Odor can be removed by catalytic or thermal oxidation if needed. closed systems are used for purification by oxygen and about 1% waste gas is produced compared to conventional aeration. Odor emissions and germ distribution caused by stripping effects are much reduced. Settling characteristics are greatly improved and less excess sludge is produced, thus reducing the costs of sludge treatment. Drawbacks include the expense of pure oxygen and the expensive closed system required to handle it. The choice of suitable materials and the problem of corrosion have not been sufficiently handled yet, and no final conclusions have been drawn. The prospects for the process are still excellent. (See also W77-06203) (Collins-FIRL)
W77-06206

RESEARCH INTO THE USE OF OXYGEN IN SEWAGE TREATMENT IN THE UNITED KINGDOM,
A. H. Goodman.
In: Waste Water Treatment. Aeration of Waste Water by Oxygen, NATO Committee on the Challenges of Modern Society, January, 1973, Brussels, Belgium, p 57-65, 2 fig.

Descriptors: *Aeration, *Oxygen, *Activated sludge, *Sludge treatment, *Nitrification, Aerobic treatment, Treatment facilities, *Waste water treatment, Sewage effluents, Pilot plants, Trickling filters, Biochemical oxygen demand, Suspended solids, *Sewage treatment.
Identifiers: United Kingdom.

British treatment plants must increase nitrification of effluents in order to increase the dilution capabilities of rivers. Trickling filter or activated sludge plants using air could achieve this goal, but their size would be economically prohibitive. The use of more compact plants using oxygen could resolve many problems involved. Three experimental plants were constructed to test the pure oxygen theories. One pilot plant which was operational produced the following results: waste water was satisfactorily oxidized to produce a low soluble BOD in the final effluent; suspended solids content was high because of carry-over activated sludge from the final settling tank; nitrification was limited to an average concentration of oxidized nitrogen of 5 miligrams/liter. Settling characteristics were excellent at all times. An intermediate settling tank and conversion to a two-step operation were hoped to increase nitrification. (See also W77-06203) (Collins-FIRL)
W77-06207

REPORT ON THE TEST CARRIED OUT AT THE MUNICH-GROSSLAPPEN SEWAGE WORKS, USING THE OXYGEN AERATION PROCESS,
O. F. Karnovsky.
In: Waste Water Treatment. Aeration of Waste Water by Oxygen, NATO Committee on the Challenges of Modern Society, January, 1973, Brussels, Belgium, p 66-76.

Descriptors: *Aeration, *Oxygen, *Activated sludge, *Sludge treatment, *Waste water treatment, Treatment facilities, Aerobic treatment, Biochemical oxygen demand, Chemical oxygen demand, Planning, Oxygenation.
Identifiers: *UNOX, *Munich(Germany), *Oxygen activated sludge.

Water authorities of the Munich, Germany region have built a test treatment plant operating with oxygen in order to test the UNOX process, to compare it with similar compressed-air plants, and to obtain data for design and operation of future facilities. Results showed an average BOD5 removal of 95% and an average COD removal of 84%. Average sludge content was 7.2 milligrams/liter and average solids content of return sludge was 2%. There was a 95% utilization of oxygen. (See also W77-06203)
W77-06208

PRELIMINARY RESULTS OF PARALLEL TEST WITH FINE BUBBLE AERATION AND OXYGENATION BY THE LINDOX PROCESS,
K. Scherb.
In: Waste Water Treatment. Aeration of Waste Water by Oxygen, NATO Committee on the Challenges of Modern Society, January, 1973, Brussels, Belgium, p 77-89, 2 fig, 2 tab.

Descriptors: *Aeration, *Oxygen, *Activated sludge, *Sludge treatment, *Waste water treatment, Aerobic treatment, Pilot plants, Test facilities, Biochemical oxygen demand, Sewage effluents, Fungi, Nitrogen, Phosphorus, Nitrification.
Identifiers: *LINDOX process.

Parallel tests were conducted in a pilot plant constructed in Germany. One test involved waste water treatment with pure (99%) oxygen, and the other used an air-oxygen (52% oxygen) mixture. The LINDOX process of oxygen aeration was used. Results revealed that the sludge index with the oxygenation process was less than conventional treatment and that excess sludge production was slightly lower than the conventional process. The occurrence of fungi in the activated sludge was characteristic and had no unfavorable effect on settling characteristics. No fungi formed in activated sludge of the conventional process. There were no significant differences in phosphorus content, ammonium and organic nitrogen or occurrence of nitrification in the two processes. Determination of excess sludge was difficult during the second test because of the high sludge index. It was suggested that optimum conditions of operation must be determined for the individual oxygenation plant. Further results indicated that BOD5 removal was similar for both processes and excess sludge production was 10-20% less in the oxygenation process. This was especially true when sludge was aged beyond six days. (See also W77-06203) (Collins-FIRL)
W77-06209

FAST PAYOUT FROM IN-PLANT RECOVERY OF SPENT SOLVENTS,
Teale (J. W.) Associates, Woodcliff Lake, N. J.
J. M. Teale.
Chemical Engineering, Vol. 84, No. 3, p 98-100, January, 1977. 1 fig.

Descriptors: *Waste disposal, *Chemical wastes, *Recycling, *Solvents, Capital costs, Operating costs, Chemical industry, Treatment facilities, Waste water treatment, Cost analysis, Industrial wastes.
Identifiers: *Solvent recovery.

A solution is proposed for the problem of solvent shortage and disposal of solvent wastes experienced by a small printing company. A small distillation unit to recover solvents was designed, capital equipment and operating costs were established, and the merit of the system, based on annual savings, was considered in this plan for in-house recovery. The system is operated with existing personnel and meets insurance company and enforcement agency standards. The design criteria for the system include single-shift operation, washings composition of 90% ethyl alcohol and 10% n-propyl acetate, provision of a tower to chill and recycle cooling water, and determination of solvent concentration. Calculations for net solvent recovery based on an 80% washings recovery, for heat requirements and vaporization, and for steam and cooling requirements determine equipment sizing and selection. A cost analysis shows a total incremental cost of $0.367/gal solvent. By alerting the rectification column of the distillation unit, its application for solvent recovery can be extended to such industries as adhesive and paint manufacture, photographic chemicals, vegetable oils, and animal by-product processing. (Kutcher-FIRL)
W77-06210

THE BIODEGRADATION OF POLYETHYLENE GLYCOLS BY SEWAGE BACTERIA,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
G. K. Watson, and N. Jones.
Water Research, Vol. 11, No. 1, p 95-100, 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Chemical wastes, *Biodegradation, *Sewage bacteria, Textiles, Surfactants, Sewage treatment, Nutrients, Inorganic compounds, Waste water treatment.
Identifiers: Polyethylene glycols, Pharmaceuticals.

Experiments were conducted to isolate bacteria which degrade polyethylene glycols (PEGs), to determine the effect of molecular weight and other nutrients on biodegradation, and to study the formation and identity of biodegradation intermediates. General findings demonstrated that higher PEG molecular weights produce a slower growth in isolated bacteria and a decrease in biodegradation. PEG 1500 was degraded by only one bacteria; PEG 4000 and polypropylene glycols were not degraded at all. Very low growth were found for all the isolated bacteria, suggesting that biodegradation rates in the environment might be slow. Biodegradation was often more rapid in the presence of other nutrients than in a medium of inorganic salts. It was thought possible that co-metabolism or more favorable conditions in the artificial sewage sometimes increased the range of PEGs attacked. Complete mineralization of PEGs and nonionic surfactants may be more rapid in activated sludge tests where there are large numbers of bacteria and an abundant supply of nutrients for microbial growth. Some evidence showed that the high molecular weight components of a mixture have a greater persistence after the high molecular weight components of a mixture have a greater persistence after partial degradation. Data suggested that intermediates with a terminal carboxyl group were produced during slow biodegradation. Other evidence indicated that the mechanism of ethoxylate chain shortening may be more complex than a simple hydrolysis to, and further metabolism of, ethylene glycol. (Collins-FIRL)
W77-06211

SILVER RECOVERY FROM PHOTOGRAPHIC WASH WATERS BY ION EXCHANGE,
De Luxe General, Inc., Hollywood, Calif.
D. J. Degenkolb, and F. J. Scobey.
SMPTE Journal, Vol. 86, No. 2, p 65-68, February, 1977. 3 fig, 10 ref.

Descriptors: *Ion exchange, Effluents, Separation techniques, Toxicity, *Industrial wastes, *Waste water treatment, Regulation, Pollution abatement, Liquid wastes, Electrolysis.
Identifiers: *Silver, Recovery, Chemical treatment.

The recovery of silver from photographic process wash water was explored by using an ion exchange method. Fixing bath waters contain about 90% of the recoverable silver. Until now, chemical precipitation and electrolytic recovery were the major means of silver recovery. Since these methods allow about 9% of the silver to reach wash waters, experiments were conducted to develop ways of reducing wash water silver. Investigations on the removal of silver by electrolytic, metal exchange, or precipitation techniques proved these methods uneconomical or ineffective. Deluxe General found that although 91% of available silver could be recovered by its electrolytic system, ion exchange yields an even greater recovery. Given clean water standards and the high cost of silver, this is important. (Collins-FIRL)
W77-06212

POLYMERIC ADSORBENTS FOR TREATMENT OF WASTE EFFLUENTS,
R. Kunin.
Polymer Engineering and Science, Vol. 17, No. 1, p 58-62, 1977. 5 fig, 4 tab, 5 ref.

Descriptors: *Polymers, *Ion exchange, *Resins, *Adsorption, *Waste water treatment, Effluents, Chemical properties, Physical properties, Phenols, Toxins.

Development of the macroreticular pore structure has been one significant advance in ion exchange and adsorbent technology. Synthetic routes for resins and polymeric adsorbents of high surface area and pore volume have reached a degree of development which allows a wide range of variation of these characteristics, and they are available in a wide variety of polarities. These new resins have both a microreticular and a macroreticular pore structure and comprise a new class of adsorbents. The adsorbents are dimensionally and chemically very stable and insoluble, and are nonionic. The less soluble the solute, the more readily the solute will be adsorbed; the aromatic-based resins are more selective for aromatic solutes. With increased chlorine substitution of the phenol, adsorptive capacity of aromatic polymeric adsorbents increases, and when the solubility parameter increases, the elution efficiency decreases. These adsorbents are being used in the pharmaceutical industry to recover and purify antibiotics and vitamins and to analyze drugs and other natural products. In addition they are bing used to remove toxins from human blood. They are also used in the treatment of industrial wastes to remove noxious compounds from waste water and to remove phenols for recovery in a usable form. (Collins-FIRL)
W77-06213

ACCUMULATION OF RESERVE POLYSACCHARIDE IN ACTIVATED SLUDGES TREATING CARBOHYDRATE WASTES,
Tokyo Metropolitan Univ. (Japan) Dept. of Biology.
S. Takii.
Water Research, Vol. 11, No. 1, p 79-83, 1977. 3 fig, 4 tab, 19 ref.

Descriptors: *Activated sludge, *Carbohydrates, *Sludge treatment, Industrial wastes, Waste treatment, Biochemical oxygen demand, Pulp wastes, Liquid wastes, *Waste water treatment.
Identifiers: *Polysaccharides, Glucose.

Activated sludges from plants treating carbohydrate-rich industrial wastes were studied to determine their capacity for accumulating polysaccharides and thereby indirectly removing the carbohydrate content of wastes. Reserve polysaccharide accumulation was relatively high for sludges treating wastes with a high carbohydrate BOD/total BOD ratio, such as fruit juice and soft drink wastes. Low carbohydrate-containing sludges, from kraft pulp, yeast culture and brewery wastes had a lower reserve polysaccharide accumulation capacity, although the wastes contained high degrees of carbohydrates. Sludges which accumulated large amounts of polysaccharide had a high initial glucose removal rate. The cumulation of reserve materials in the sludge seemed to be dependent upon the composition of the waste to be treated, and the proportion of carbohydrate in the feed was especially significant. (Collins-FIRL)
W77-06214

BENEFITS OF SPREADING WHEY ON AGRICULTURAL LAND,
Kraftco Corp., Glenview, Ill.
K. S. Watson, and A. E. Peterson.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 24-34, January, 1977. 8 fig, 4 tab, 5 ref.

Descriptors: *Waste disposal, *Dairy industry, *Water pollution control, Cost analysis, Crops, Irrigation, Nutrients, Food processing industry, Groundwater, Soil amendments, Soil analysis, Phosphorus, Nitrogen, Potassium, Calcium, Sodium, Magnesium.
Identifiers: *Land application, *Whey.

The disposal of whey in the dairy industy must be controlled to prevent water pollution problems. Two alternatives are by-product recovery for feed and food supplements and land disposal. The latter method, for reasons of cost, is more feasible for smaller cheese plants. Field studies conducted by the University of Wisconsin Soil Science Department determined the effects of land whey disposal on soil mineral content and permeability and on crop yield. Applications by a pumping and spraying system were made in 1972-1973 at an optimum rate of 25 mm whey in 13 mm increments on fallow land. Whey solids contain about 0.5% nutrient value, consisting of N, P, K, Ca, Mg, Na, and chlorides. Experiments with corn were inconclusive but suggest that whey could supplement or replace fertilizer and have a beneficial effect on yield. Hay yields increased with small whey applications, but crops burned when whey was applied to established crops. Soil phosphorus and nitrates increase as whey rates are increased. Although soils showed a phosphorus build-up, there was little leaching to contaminate groundwater. Potassium levels increased to a level capable of causing crop growth deficiencies when whey application was high. Whey benefits soil structure and infiltration rate. Soil examination showed anaerobic conditions which limited bacterial activity and reduced soil aggregation. The studies showed that at doses of 17 to 25 mm per field, groundwater pollution risk is slight. (Kutcher-FIRL)
W77-06215

PRODUCTION OF GIBBERELLIC ACID USING A DAIRY WASTE AS THE BASAL MEDIUM,
Massey Univ., Palmerston North (New Zealand). Dept. of Biotechnology.
I. S. Maddox, and S. H. Richert.
Applied and Environmental Microbiology, Vol. 33, No. 1, p 201-202, January, 1977. 2 fig, 5 ref.

Descriptors: *Dairy industry, *Liquid wastes, Filtration, Nutrients, Mineralogy, Metabolism, Fermentation, Nitrogen, Waste treatment, Chemical reactions.
Identifiers: *Gibberellic acid, Lactose.

The use of lactic casein whey filtrate as a nutrient source for producing a fungal secondary metabolite was investigated. Whey filtrate is reasonably high in lactose, contains minerals needed for microbial growth, and is low in nitrogen. The nitrogen deficiency makes it inappropriate for the growth of one cell protein, but it

is suitable for secondary metabolite growth. Supplementary nutrients studied were (NH4)2S04, yeast extract, magnesium sulfate, and KH2PO4. Results indicated that 750 milligrams/liter was the maximum gibberellic acid yield and only MG(2+) ions were needed as supplements. The use of whey filtrate was deemed feasible as a basal medium for the production of gibberellic acid because little supplementation was required. (Collins-FIRL)
W77-06216

WASTE TREATMENT SYSTEM CUTS WATER USE BY 2/3.
Industrial Finishing, Vol. 53, No. 2, p 26-28, February, 1977.

Descriptors: *Metals, Waste treatment, Water reuse, Sludge treatment, *Waste water treatment, Pollution abatement, Water pollution sources, Sedimentation, Hydrogen ion concentration, Zinc, Nickel, Chromium, Copper, Oxidation, Chlorine, *Water conservation.
Identifiers: Sodium hypochlorite.

A Chicago plating operation featuring the recirculation of metallic rinses is described. The operation includes, in addition to the recirculation feature, acid, alkali, cleaner dumping and batch treatment, preliminary sludge collection, final pH adjustment, and final sludge collection, aging, and thickening. There are recirculating rinses for zinc, nickel, chromium, and copper which drain by gravity into separate sumps automatically adjusted for pH. No settling or precipitation occurs in the sumps because of the high agitation rate caused by the incoming rinse. The rinses are pumped to separate settling tanks and treated by sodium hypochlorite to release chlorine to oxidize CN to CO2 and N2. After treatment, they are recirculated to the cyanide rinse tanks. Spent acid and floor spills are neutralized and the correct pH precipitates metallic hydroxides. After settling, the clear liquid is tested for soluble metals and decanted. The sludge is pumped to the sludge decant tank. Plating lines and the brass cleaning line are periodically dumped. The cleaner is drained to a sump and pumped to a settling tank where oil is skimmed into barrels. The rest is slowly drained into the final pH treatment tank. Once a day, the metallic hydroxides are pumped from the settling and batch treatment tanks to general sludge decant tanks, and replaced by equivalent amounts of fresh water to maintain constant quantities of recirculating rinse. A final pH adjustment is made for all water going to the sewer from the decant tanks and from running rinses. An underground tank stores water from the final pH adjustment tank before draining to sewers. (Collins-FIRL)
W77-06217

ASBESTOS IN WATER: MINING AND PROCESSING EFFLUENT TREATMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
J. Lawrence, and H. W. Zimmermann.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 156-160, January, 1977. 5 fig, 5 tab, 6 ref.

Descriptors: *Asbestos, *Metals, *Sedimentation, *Filtration, Water pollution sources, Industrial wastes, Sludge treatment, Coagulation, Polyelectrolytes, Effluents, Separation techniques, Physical properties, Chemical properties.

Data was presented to support the use of simple, economic, and effective treatment methods based on sedimentation and filtration to remove most suspended asbestos from mining and asbestos processing plant effluents. Sedimentation followed by mixed media filtration was very effective. In instances where fiber content of effluents was one ppb or less sedimentation alone was ineffective; these cases should be treated by direct filtration. Diatomite filters were more effective than mixed media filters and could prove useful for treatment of potable water in mining communities. Disposal was not considered in this study, but in mining areas, the removed asbestos could be returned to an unused portion of the mine. For urban areas, where disposal problems are more serious, further studies are needed. (Collins-FIRL)
W77-06218

CHEMICAL OXIDATION OF CYANIDE SPECIES BY OZONE WITH IRRADIATION FROM ULTRAVIOLET LIGHT,
Houston Research, Inc., Tex.
C. E. Mauk, H. W. Prengle, Jr., and R. W. Legan.
Transactions of the Society of Mining Engineers, AIME, Vol. 260, No. 4, p 297-300, December, 1976. 7 fig, 1 tab.

Descriptors: *Oxidation, *Ozone, *Metals, *Irradiation, *Ultraviolet radiation, *Waste water treatment, Economics, Performance, Chemical reactions, Mass transfer.
Identifiers: *Cyanide, *Chemical oxidation, *Chemical treatment.

A study was performed to observe the oxidative destruction of free and complexed cyanides in the waste water of electroplating and color photographic processes. Of several possible methods, only ozone and alkaline chlorination had any significant potential for this application. In laboratory investigations, ozone and ultraviolet treatment were chosen and a pilot study was conducted to gather data. Results of the pilot study indicated that the rate of oxidation for concentrate waste is limited by the rate of ozone transfer from the gas phase to the water, but the oxidation rate of dilute waste may be limited by the chemical reaction rate. Effective, optimized staging is the key to lower capital and operating costs; this treatment allowed the destruction of many waste water species whose oxidation rate would have been too slow to be economically feasible. Industrial and municipal waste streams with concentrations up to 70,000 milligrams/liter can be reduced below the limit of analysis. This is the only method capable of completely destroying iron complexed cyanides. For cyanide treatment, the order of the reaction is one for both ozone and cyanide, with one molecule of ozone needed for each molecule of cyanide. With proper design and optimization, an overall utilization of 90% or better can be expected. Mathematical models and laboratory techniques already allow rapid assessment of other waste streams. Sizing and design of optimum treatment systems for a complete range of flow rates and concentrations can be completed with a minimum of cost and time. (Collins-FIRL)
W77-06219

THE TREATMENT OF WASTE WATERS WITH PEAT MOSS,
Sherbrooke Univ., (Quebec).
B. Coupal, and J.-M. Lalancette.
Water Research, Vol. 10, No. 12, p 1071-1076, 1976. 3 fig, 3 tab, 5 ref.

Descriptors: *Peat, *Heavy metals, *Ion exchange, Separation techniques, *Waste water treatment, Industrial wastes, Waste treatment, Hydrogen ion concentration, Adsorption, Water pollution sources.

The use of Peat moss to treat waste waters containing heavy metals was studied. Peat has a natural capacity for ion exchange with metals like copper, zinc, lead and mercury; its ability to retain cations is related to the pH of the solution. It efficiently adsorbs most metals between the pH values of 3.0 and 8.5. Contact treatment was investigate on an apparatus with a 20.00 gpd capacity. Parameters of operation included the peat mat thickness, the screen belt speed, the mat hydraulic capacity, and the disposal of the peat. At a thickness of one inch, erosion is at acceptable limits, flow-through is high, and the mat is easy to make. Screen belt speed should be such that when the peat reaches the end of the screen it has efficiently adsorbed all the pollutants collected. Hydraulic capacity can go as high as 50 gallons/square foot/hour and the used peat can be either burned or used as landfill. (Collins-FIRL)
W77-06220

THE TREATMENT OF WASTE EMULSIFIED OILS BY ULTRAFILTRATION,
Abcor Environmental Systems Ltd., Surbiton (England).
P. A. Bailey.
Filtration and Separation, Vol. 14, No. 1, p 53-55, January/February, 1977. 2 fig.

Descriptors: *Filtration, *Oil wastes, *Waste water treatment, Separation techniques, Oil industry, Industrial wastes, Incineration, Pollution abatement, Disposal, Membranes.
Identifiers: *Ultrafiltration.

The use of ultrafiltration in the treatment of waste emulsified oils was reviewed. A semi-permeable membrane of polymeric materials was used. Under slight pressure, emulsified oil particles are retained while water molecules pass through. The principles of the method were explored. Factors which affect performance were oil concentration, temperature, time, permeate quality, and pretreatment. For ultrafiltration, advantages were little required pre-treatment, no necessary chemical additions or heat input, little need for further treatment of water, no sludge formation requiring separate disposal, and an oil concentrate capable of supporting combustion. About 100 plants of this type have been installed. (Collins-FIRL)
W77-06221

DESIGNING PARALLEL-PLATES SEPARATORS,
Empresa Nacional del Petroleo, Concon (Chile).
J. G. Miranda.
Chemical Engineering, Vol. 83, No. 3, p 105-107, January, 1977. 4 fig, 3 ref.

Descriptors: *Separation techniques, *Oil industry, *Oil wastes, Industrial wastes, *Waste water treatment, Reynolds number, Flow, Equipment, Design criteria, Equations.
Identifiers: *Petroleum refinery effluents, *Parallel plates separators.

A method has been developed for designing parallel-plates separators which overcome the typical problems encountered in using API type separators for oil-water separation of petroleum refinery effluents. The parallel-plates interceptor (PPI) minimizes difficulties associated with space requirements, evaporation losses, construction cost, fire hazard, and high steam consumption. With the PPI, oil globules do not have to cross the entire separator depth before rising to the surface. Parallel plates inclined at 45 degrees allow oil to coagulate at the plates' undersurfaces and to slide upward to the liquid surface for skimming; concurrently, solids collecting at the plates' tops slide downward. The PPI can thus be much smaller than the API separator, eliminating the need for skimmers, and requiring only one pump and two weirs for oil recovery. A theoretical design approach to the PPI is presented. Equations are given to obtain the Reynolds number and to determine retention time, and Stokes' Law is employed. While greater efficiency results from the smaller distance between plates, clogging and diminished flow area can become a problm. Parameters are suggested for the best design range. (Kutcher-FIRL)
W77-06222

BIO-TREATMENT OF EFFLUENTS WITH BOD BELOW 100 MG/L,
W. G. Cobbett.
Paper Technology and Industry, Vol. 17, No. 8, p 285-287, 289, 299, December, 1976. 7 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Biological treatment, Pulp and paper industry, Liquid wastes, Activated sludge, Pollution abatement, Pilot plants, Performance, Water quality control, *Waste water treatment.

The biological treatment of low BOD effluents from two paper mills was examined. Data was necessary to form design and cost criteria. Treatment by percolating filter and activated sludge systems were successful at high hydraulic loads. This loading did not cause bulking of activated sludge, but ponding can occur when the bio-filter is insufficiently open or the effluent is poorly clarified. The overall area needed for such a plant is three times that of an equal activated sludge plant. A pilot plant operation was conducted in three phases: feeding of effluent to acclimatize the units, increasing of flows until limiting values were reached, and varying of operation to determine advantageous and disadvantageous influences. BOD concentrations in effluents were far below expected levels, often below levels considered normal by sewage works. Percolating filters removed about twice the BOD load expected for conventionl filters. The behavior of the percolating filters and activated sludge units was evaluated. Factors studied relative to plant operation were nutrients, pH, temperature, and other chemicals. Chemicals normal to the paper mill industry had no effect upon operation. Sewage fungas in the receiving stream at and below the point of discharge was a problem. These are prevalent when effluent has a low BOD, and when nitrogen and phosphorus sources are readily available. (Collins-FIRL)
W77-06223

TREATMENT OF CONTAMINATED CONDENSATES,
Sandwell International, Inc., Portland, Oreg.
G. W. Hough, and R. W. Sallee.
Tappi, Vol. 60, No. 2, p 83-86, February, 1977. 4 fig, 2 tab.

Descriptors: *Condensation, *Pulp wastes, Industrial wastes, Waste treatment, Odor, Color, Biological treatment, Evaporation, Biochemical oxygen demand, *Waste water treatment, Cost comparisons.
Identifiers: Total reduced sulfur, Air stripping, Steam stripping.

The treatment of contaminated condensates from the condensation of digester relief and blow vapors and vapors from multiple-effect evaporators was investigated. Some Scandinavian and North American paper mills have used steam or air strippers to treat and reuse these condensates. The North American practice has been to use a portion of these condensates for lime mud washing and to sewer the remainder for BOD removal by waste water treatment systems. In-plant treatment alleviates some problems of external waste water treatment. Condensate treatment falls into two categories: removal of odorous compounds and removal of BOD compounds. Air and steam stripping are suitable for the first, and either steam stripping or biological treatment can handle the latter. Air stripping deodorizes and handles some detoxification by removing TRS compounds (hydrogen sulfide and light organic sulfides) and can remove 90% or more of these compounds. It significantly contributes to detoxification but only reduces BOD by about 10-20%. Steam stripping uses steam for the vapor phase of a multi-stage contacting or 'refluxing' column to remove odorous, toxic, and BOD contaminants from condensates. TRS and toxicity are reduced more than 95% and BOD is reduced by 60-85%. Biological treatment in aerated lagoons or activated sludge systems is about 90% efficient in BOD removal. Cost comparisons suggest that separation and reuse of cleaner evaporator contaminated condensates would reduce internal treatment costs by more than 50%. (Collins-FIRL)
W77-06224

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS,
Lundberg (A. H.), Inc., Mercer Island, Wash.
For primary bibliographic entry see Field 5G.
W77-06225

SLUDGE DEWATERING IN TEXTILE PLANTS,
Kendall Company, Griswoldville, Mass.
C. Cole, S. Coor, and J. Albert.
Industrial Wastes, Vol. 23, No. 1, p 14-16, January/February, 1977. 4 fig, 2 tab.

Descriptors: *Dewatering, Industrial wastes, *Textiles, Bleaching wastes, *Activated sludge, Flotation, Chemical reactions, Waste treatment, Performance, Odor, Suspended solids, *Waste water treatment, Massachusetts.

Investigations were conducted to find a solution to the problem of waste activated sludge dewatering at the Kendall Textile Bleaching Plant in Massachusetts. Its cotton bleaching process produced about 1 million gallons/day of waste water with an average of 100 milligrams/liter of suspended solids and a BOD in the 500/600 milligrams/liter range. A mechanical dewatering system was instituted to eliminate the odor problem of a modified extended aeration activated sludge process. This sludge was unusually difficult to dewater. A flotation thickener consisting of a cylindrical flotation tank using a highly efficient counterflow pattern for solids removal was developed. Chemical conditioning using polymers doubled the solids loading range and increased the float concentration. Thickening improved centrifuge performance and when sludge was thickened to 2.7% feed solids, centrifuged loading capacity increased about three to five times and cake solids concentration increased 2 to 3%. The flotation and centrifuge combination was successful in achieving the specified goals. (Collins-FIRL)
W77-06226

THE REMOVAL OF ACID DYE FROM EFFLUENT USING NATURAL ADSORBENTS--I,
Queen's Univ., Belfast (Northern Ireland). Dept. of Industrial Chemistry.
V. J. P. Poots, G. McKay, and J. J. Healy.
Water Research, Vol. 10, No. 12, p 1061-1066, 1976. 8 fig, 5 tab, 15 ref.

Descriptors: *Peat, *Dyes, *Adsorption, *Textiles, Water pollution sources, Pollution abatement, Liquid wastes, Waste treatment, Separation techniques, *Waste water treatment, Chemical reactions, *Feasibility studies.
Identifiers: Telon Blue(C.I. acid blue 25).

Results are presented from the first of a two-part study to determine the feasibility of using natural adsorbents for acid dye removal. This report is on the usefulness of peat. The dye used was Telon Blue or C. I. acid blue 25. Results show that peat is a suitable adsorbent for acid blue dye, although a contact time of 2 hours is necessary to reach equilibrium. Specific surface areas available for dye adsorption are lower than values for activated carbon, but the low cost of peat and the alleviation of an activation process counter the greater amount of peat needed. Spent peat can also be burned and used for steam raising, while carbon is too expensive to burn and must be chemically or biologically regenerated, resulting in a loss of adsorbent. Intraparticle diffusion is not rate controlling and this, combined with other data, indicates that the removal of acid dye by peat involves a complex mechanism, this mechanism is now being studied. (See also W77-06228) (Collins-FIRL)
W77-06227

THE REMOVAL OF ACID DYE FROM EFFLUENT USING NATURAL ABSORBENTS-II,
Queen's Univ., Belfast (Northern Ireland). Dept. of Industrial Chemistry.
V. J. P. Poots, G. McKay, and J. J. Healy.
Water Research, Vol. 10, No. 12, p 1067-1070, 1976. 8 fig, 2 tab, 6 ref.

Descriptors: *Adsorption, *Dyes, *Wood, *Textiles, Water pollution sources, Pollution abatement, Liquid wastes, Waste treatment, Separation techniques, *Waste water treatment, Chemical reactions.
Identifiers: Telon Blue(C.I. acid blue 25).

The second part of a study on the removal of dyes from textile production effluents is presented. Telon Blue, or C.I. acid blue 25, was again the test dye. The use of spruce wood as an adsorbent was investigated. Acid dye adsorption on wood was very successful, but long contact times were required for equilibrium to be reached. As with peat, data indicated a complex adsorption process which is probably restricted to a small area of the wood particles' outer shells. Time data analysis to determine if intraparticle diffusion is the rate limiting step was not successful. Wood, as peat, can be burned and the heat can be utilized for steam raising. (See also W77-06227) (Collins-FIRL)
W77-06228

IWS LOW CHROME EFFLUENT DYEING,
International Wool Secretariat, Ilkley (England). Technical Centre.
L. Benisek.
International Dyer and Textile Printer, Vol. 156, No. 12, p 600-604, December, 1976. 4 fig, 3 tab.

Descriptors: *Dyes, *Textiles, *Chromium, Water pollution sources, Pollution abatement, Liquid wastes, Waste water treatment, Chemical reactions, Filtration, Alkalis(Bases), Analytical techniques.
Identifiers: Wool industry.

The problem of controlling chromium in effluents from the wool dyeing process was considered. One approach is to treat separately the effluent, reducing dichromate with sulfite under acid conditions, precipitating the Cr(III) formed with alkalis, and then filtering and disposing of the chromium hydroxide. The other possible approach is to modify the chroming procedure. The latter was considered more simple and economical. A quantitative analytical method for determination of Cr(VI) and Cr(III) in the bath was developed. The IWS Low Chrome Effluent Dyeing procedure was finally developed to reduce the concentration of Cr(VI) to below 0.5 Cr(VI) ppm and of Cr(III) to below 10 ppm. Lowest concentrations were obtained at a pH of 3.4 to 3.6. The use of lactic acid in the process and the control of pH are the only additional operations beyond normal processing. (Collins-FIRL)
W77-06229

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W77-06230

A POTENTIAL ORGANIC DISINFECTANT FOR WATER PURIFICATION,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering, and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
L. K. Wang, and G. G. Peery, III.
In: The 1975 New England Water Works Association Meeting, January 16, 1975, Waltham, Massachusetts, p 1-24. 4 fig, 7 tab, 28 ref.

Descriptors: *Waste water treatment, *Organic compounds, *Disinfection, *Domestic water, E. coli, Water temperature, Hydrogen ion concentration, Organic compounds.

Dosages of cetyltrimethylammonium bromide (CTAB), cetyldimethylbenzylammonium chloride (CDBAC), and dialkyldimethylammonium chloride (DDAC) from 2.5 to 10.0 mg/liter were added to aged tap water containing high concentrations of Escherchia coli and no residual chlorine. All but one gave zero residual coliform counts at room temperature, nearly neutral pH, and 10 min contract time. All three surfactants had strong bactericidal properties and could be potential disinfectants for water purification and waste water treatment. All were overdosed. Further experiments were conducted at 0.5 mg/liter and 1.0 mg/liter using CTAB and CDBAC. Some residual coliforms were detected. Best results were obtained with one mg/liter at 10 min contact time. Residual disinfectant concentrations were close to initial disinfectant concentrations. Apparently CTAB and CDBAC are not oxidizing agents. Althouth CTAB seems to have slightly better bactericidal properties than CDBAC, the latter was chosen for futher study because it is considered nontoxic at low concentrations. pH was adjusted at 5 to 9 using sulfuric acid and sodium hydroxide; 0.5 mg/liter CDBAC and 5, 10, and 15 min contract times were used. Minimum contact time was tentatively concluded to be 10 min, the longer the better. Optimum pH range was 7 to 9. Contact times of 5, 10, and 15 min and 0.25, 0.5, and 1.0 mg/liter CDBAC were compared; the optimum was 10 min at 1.0 mg/liter under the pH, temperature, and coliform concentration conditions used. Final tests were conducted at 22 and 30C and 0.25, 0.5, and 1.0 mg/liter CDBAC. There was no difference in residual coliform counts for the two temperatures. All tests indicated zero residual coliform count at one mg/liter. For treating excellent sources of water supply, 0.5 mg/liter CTAB or CDBAC with 5 min contact time will be sufficient. (Snyder-FIRL)
W77-06250

ENERGY REQUIREMENTS FOR WASTEWATER TREATMENT. PART 2,
California Univ., Davis. Dept. of Water Science and Engineering.
R. M. Hagan, and E. B. Roberts.
Water and Sewage Works, Vol. 123, No. 12, p 52-57, December, 1976. 4 fig, 17 tab.

Descriptors: *Energy, *Waste water treatment, *Treatment facilities, *Activated sludge, Treatment, Sludge treatment, Waste disposal, Electrical equipment, Electrical engineering.

Because of the concern over the availability and cost of energy sources, cost for treatment facilities have been determined. Public Law 92-500 has influenced this subject by its requirement that treatment plants provide a minimum of secondary treatment by July 1, 1977. Activated sludge is commonly used to provide this treatment level and direct electrical power required for a typical activated sludge plant is about 71,000 kwh/day for a 100 mgd plant with gravity discharge of effluents. Sludge treatment for the same size plant (digestion and landfill disposal) would use 56,000 kwh/day. Miscellaneous power needs account for another 24,000 kwh/day. The use of digester gas could recover nearly 69,000 kwh/day of energy, producing a net direct energy requirement of 61,462 kwh/day. Other energy needs are for manufacture and transport of chlorine and other input chemicals, construction needs, and advanced treatment (such as phosphorus and nitrogen removal). Another factor is the possible need of activated carbon adsorption for refractory organics removal from waste water. If land treatment is available, it can replace advanced waste treatment processes. Energy requirements for most common uses of treatment products and effluents are also estimated.(Collins-FIRL)
W77-06252

LONDON'S STORMWATER PROBLEM,
Greater London Council (England).
For primary bibliographic entry see Field 5B.
W77-06297

PRIVATE SEWAGE DISPOSAL IN MAINE.
Maine Dept. of Environmental Protection, Augusta.
For primary bibliographic entry see Field 5G.
W77-06371

WATER POLLUTION FROM INDUSTRIAL SOURCES IN SWEDEN AND RECENT TRENDS TO PREVENT IT,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5G.
W77-06383

PROCESS FOR RECOVERY OF DISSOLVED MERCURY SALTS FROM AQUEOUS SOLUTIONS,
Georgia-Pacific Corp., Portland, Oreg. (Assignee).
J. A. Neal.
U.S. Patent No. 3,989,623, 3 p, 7 ref; Official Gazette of the United States Patent Office, Vol 952, No 1, p 294, November 2, 1976.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution sources, *Chemical wastes, *Separation techniques, Chemical reactions, Water pollution control, Water quality control, *Mercury.

The objects of this invention are to provide a process for removing mercury from aqueous effluents without using a heavy metal reactant which will contaminate the treated effluent; to provide a process which is effective to reduce the mercury concentrations to below one part per million; and to provide an effective process requiring minimum control. These objects are attained by treating the effluent stream containing the mercury with a water-soluble sulfide compound to react with the mercury to form mercury sulfide, contacting the effluent with zinc sulfide particles to combine the mercury sulfide with the zinc sulfide particles and to remove the mercury sulfide from the effluent. Apparently, the fine colloidal particles of mercury sulfide are adsorbed to the surface of zinc sulfide particles or in some other manner becomes attached to the particle to be thus easily removed from the effluent. Since zinc sulfide is insoluble, practically no contamination of the effluent with zinc ion is obtained. Generally, more effective contact can be made by intermixing the zinc sulfide with the effluent prior to filtration, centrifugation, settling or other separation means. (Sinha-OEIS)
W77-06445

METHOD AND APPARATUS,
Ecodyne Ltd., Oakville (Ontario). (Assignee).
W. A. Wachsmuth.
U.S. Patent No. 3,989,624, 8 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 952, No 1, p 294, November 2, 1976.

Descriptors: *Patents, *Industrial wastes, *Industrial water, *Waste water treatment, Effluents, Water pollution sources, Water purification, Water quality control, *Water reuse, Anion exchange, Separation techniques, Resins, Equipment.
Identifiers: *Chromium-plating rinse water.

The invention provides a method and apparatus for handling chromium-containing anions from the rinse bath which is used to rinse plated objects. The source of anions in the rinse bath will ordinarily be a simple residual solution of chromate ions that have been carried over from the plating bath. However, if any significant drying has taken place, it is also possible that this source of chromate ions will be present in solid form on the plated object. This source of chromate ions must be rinsed from the plated object, and in accordance with this invention, the delivery of these anions to the environment is prevented, Furthermore purified rinse water from the plating operation, which has passed through ion-exchange resin, is used not only for the rinsing of plated objects, but also for the backwashing and rinsing of the ion-exchange resins and for the makeup of ion exchange resin regenerant solutions. The solution of chromium-containing anions, which will ordinarily be collected in a rinse tank or basin, is delivered to an anion-exchange resin, where the chromium-containing anions are removed, and exchanged for hydroxide ions, so that purfied water is formed. This purified water is delivered from the anion-exchange resin to a reservoir. Water from the reservoir may then again be passed over an object having a source of chromium-containing anions to repeat the rinsing operation. (Sinha-OEIS)
W77-06446

REMOVABLE GAS DIFFUSER AND APPARATUS THEREFOR,
Envirex Inc., Waukesha, Wis. (Assignee).
R. E. Crandall.
U.S. Patent No 3,989,627, 9 p, 11 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 952, No 1, p 296, November 2, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Aeration, Water treatment, Water pollution treatment, Equipment, Plastics, *Aerobic treatment.
Identifiers: *Aeration diffusers.

Aeration diffusers particularly as they are used in the treatment of sewage by aerobic digestion require periodic removal for maintenance. Horizonatal headers along a wall of each tank carry the submerged diffusers and are connected by vertical hanger pipes to the air supply mains. Rotary joint in the hanger pipes and a suitable hoist allow the headers to be lifted from the tank to a convenient working position above the walkway for inspection maintenance or replacement of the diffusers. However, lifting such weight requires a sturdy hoist which is difficult to maneuver. The use of plastics and resins instead of metals now offers great advantages as to cost and weight, excepting that the light weight of such equipment also now required provisions for holding the header in the tank in its operating position. In this invention a lifting bracket extends upward from the lower pipe and includes detent blocks which engage the dual pipes to control the movement of the header and its seating in a lower bracket within the tank. The flexibility of the dual pipes is utilized to provide the locking effect which secures the header inthe bracket in its operative position within the tank. (Sinha-OEIS)
W77-06447

DEGRITTING AND FIBER REMOVAL SYSTEM,
Dorr-Oliver Inc., Stamford, Conn. (Assignee).
T. H. Bier.
U.S. Patent No. 3,989,628, 6 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 952, No 1, p 296, November 2, 1976.

Descriptors: *Patents, *Waste treatment, *Water pollution sources, *Activated sludge, *Separation techniques, Fibers(Plants), Filtration, Equipment.
Identifiers: Hydrocyclones.

In the treatment of waste activated sludge the underflow of the secondary clarifier is often concentrated in a disc nozzle centrifuge prior to final disposal. The centrifuge employed in this dewatering process is subject to plugging by the fibers which commonly occur in the sludge. A rotary strainer or a screen device are ways in which the fibers may be removed from the sludge. Sludge undergoing treatment may also contain abrasive grit and it is prudent to remove such grit to prevent wear on the devices through which the sludge must

pass. This invention provides an improved degritting and fiber removal unit which is transportable as a unit. Hydrocyclones constitute the first stage of a two stage system and a screen constitutes the second stage. The first stage is employed in such a way that only a limited amount of energy is consumed, leaving a sufficient amount of energy for the second stage. Thus, the hydrocyclones are sized to require a pressure drop amounting to approximately 50% of the overall pressure available. The underflow manifold may be inclined from the horizontal to provide gravity flow of the grit-containing effluent and the constricted outlet of the underflow manifold limits the amount of underflow discharge. (Sinha-OEIS)
W77-06448

POSITIVE PROGRESSIVE BIOCHEMICAL DIGESTION OF ORGANIC WASTE,
W. J. Hargraves.
U.S. Patent No. 3,990,967, 16 p, 14 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 952, No 2, p 760, November 9, 1976.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Domestic wastes, *Water pollution treatment, Water quality control, Aerobic treatment, Aeration, *Organic wastes, Digestion.
Identifiers: *Biochemical digestion.

An aerobic sewage system is constructed of a number of series-connected turbulent, aerated stages which progressively purify the waste to essentially organic-free water without building up sludge. The system is especially suitable for a compact toilet, such as a toilet on a pleasure boat or recreational vehicle. Discharge of effluent can be avoided by evaporation of water from the system by venting the stages and if necessary by heating the effluent from the last stage. (Sinha-OEIS)
W77-06453

MEANS FOR INCREASING THE FLOW ACROSS A REVERSE OSMOSIS MEMBRANE USING AN ALTERNATING ELECTRIC FIELD,
Desares Stiftung fuer Forderung der Forschung zur Entsalzung des Wassers (Switzerland). (Assignee).
For primary bibliographic entry see Field 3A.
W77-06454

METAL CYANIDE COMPLEX COMPOUND DISPOSAL,
Texaco Inc., New York. (Assignee).
D. W. Wright, and G. D. Carr.
U.S. Patent No. 3,990,971, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 952, no 2, p 761, November 9, 1976.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Water pollution treatment, Water quality control, Phenols, Separation techniques, Metals, Waste disposal.
Identifiers: *Cyanides, Vaporization, Refinery wastes, Catalytic cracking processes, Flue gases, *Metal cyanide complex compounds.

An improved method disposes of foul waters containing about 2-100 ppm metal cyanide complex compounds produced from a fluidized catalytic cracking process in an environmentally acceptable manner. The foul waters containing the metal cyanide complex compounds are contacted with hot flue gas comprising about 8-15 volume percent C02, 0-10 volume percent CO, 15-25 volume percent H20, and 1-2.0 volume percent 02 for residence time of at least about 10 sec. The foul waters are completely vaporized and the metal cyanide complex compounds are decomposed at temperatures in the range of 750-2000 deg. The foul waters may contain 0-2000 ppm phenolic compounds which are likewise decomposed upon contact with such flue gas. No special reaction or incineration vessels are required, since the foul waters may be sprayed directly into a flue gas line. (Sinha-OEIS)
W77-06457

CYCLONE WITH PLURAL PERIPHERAL DISCHARGE TUBES,
Y. Nishioka.
U. S. Patent No. 3,990,976, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 952, No 2, p 762, November 9, 1976.

Descriptors: *Patents, *Separation techniques, *Centrifugation, *Waste water treatment, Water treatment, Water pollution control, Flocculation, Water quality control, Equipment.
Identifiers: *Cyclone separators.

In a cyclone separator a number of axially aligned solids collection tubes are positioned on the outermost periphery of the main body to a container positioned beneath the body. When water containing solids in the form of rough flocks and the like is jetted continuously through the injection pipe into the drum, it will result in a cyclonical flowing of the liquid under the guide of the inside peripheral wall of the drum. Due to the cyclonical movement solids of bigger gavity receive bigger centrifugal force thereby moving outward from the center of the drum. The solids of bigger gravity and size tend to move farther from the center thereby coming closer to openings in the drum and into the collection tubes. Solids of smaller gravity and size fall along the lower peripheral wall into the cone portion of the drum and into other tube openings. (Sinha-OEIS)
W77-06460

THE IMPACT OF PUBLIC LAW 92-500 ON MUNICIPAL POLLUTION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
B. W. Lykins, Jr., and J. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-248 212, Price codes: A14 in paper copy, A01 in microfiche. Report EPA 600/2-76-018, January 1976. 303 p, 48 fig, 35 tab.

Descriptors: *Effluents, *Local governments, *Sewage treatment, *Municipal wastes, Cities, Waste disposal, Waste water treatment, Water pollution, Water pollution sources, Federal government, Administrative agencies, Governmental interrelations, State governments, Technology, Research and development, Planning, Law enforcement, Regulations, Permits, State jurisdiction, Legislation.
Identifiers: *Public Law 92-500, Licenses, Administrative regulations.

The purposes of this report are: (1) assess the ability of existing technology to meet the effluent quality requirements imposed by Public Law 92-500; (2) delineate areas in which research is needed to upgrade current deficiencies. The objective of Public Law 92-500 is to restore and maintain the biological integrity of the nation's waters, by achieving water clean enough for recreational uses and wildlife propagation by 1983, and by eliminating all discharges of pollutants by 1985. States are given the primary responsibility for achieving these goals, but the Environmental Protection Agency (EPA) is empowered to act if the states do not. Implementation of Public Law 92-500 has generated a number of comprehensive federal, regional and state programs. As a result of information collected from these programs, the report concluded that it would be difficult to project what technology would be needed to meet the goals of Public Law 92-500. Several plans were not enforceable because of unresolved conflicts between the EPA and state governments. It appears that available technology could achieve the required removal of suspended solids, nitrogen and phosphorus, but additional technology is needed to reduce BOD concentrations to the required limits, and to provide alternative disinfection processes. (Moorhouse-Florida)
W77-06532

CERTIFICATION PROCEDURES AND DESIGN AND CONSTRUCTION REQUIREMENTS FOR MARINE SANITATION DEVICES.
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 70, p 15324-26, April 12, 1976. 3 p.

Descriptors: *Water pollution sources, *Coast Guard regulations, *Sewage disposal, *Waste disposal, Standards, Boating regulations, Pollution abatement, Pollutants, Ships, Legal aspects, Water quality control, Water quality, Water quality standards, Coliforms, Sewage effluents, Sewage treatment, Wastes, Water pollution, Treatment, Boats, Regulation, Environmental sanitation, Federal Water Pollution Control Act, Administrative agencies.
Identifiers: *Sanitation devices, *Marine toilets, *Marine sanitation devices.

Pursuant to the Federal Water Pollution Control Act, as amended, the Coast Guard Marine Sanitation Device Regulations have been amended to conform with new standards of the Environmental Protection Agency (EPA). Vessel operators are advised of certain EPA designated no-discharge areas. Manufacturers of discharge treatment devices must now label them according to EPA criteria as well as advice consumers of the designated no-discharge areas. Installation of flow-through devices on new vessels no longer requires an EPA waiver. Finally, the amendments contain new tests for the evaluation of sanitation devices against EPA standards for coliforms and suspended solids. These amendments are promulgated without notice of proposed rulemaking. The admendments reflect EPA standards with which, under the Federal Water Pollution Control Act, Coast Guard regulations must be consistent. (Joseph-Florida)
W77-06558

5E. Ultimate Disposal Of Wastes

THE ULTIMATE DISPOSAL OF SLUDGE,
For primary bibliographic entry see Field 5D.
W77-06114

GAS FROM SEWAGE, SLUDGE PYROLYSIS ENERGY SOURCE SAYS CALIFORNIA STUDY.
For primary bibliographic entry see Field 5D.
W77-06118

RESIDUAL SATURATION OF DEWATERED FILTER CAKES,
Exeter Univ. (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-06121

USES AND CULTIVATION OF SEAWEEDS,
Plymouth State Coll., N. H. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5D.
W77-06122

NEW REFUSE INCINERATÓR TO BURN ATOMIZED SLUDGE,
P. Millbank.
Surveyor, Vol. 148, No. 4405, p 15, November, 1976.

Descriptors: *Treatment facilities, *Incineration, *Waste disposal, *Sludge disposal, *Waste treatment, Domestic wastes, Sludge treatment, Disposal, Solid wastes, Ultimate disposal.

A new British refuse incinerator capable of handling up to 3,700 tons of domestic and bulky household waste a week for a population of 600,000 is described. Eventually the facility will handle 1,440 tons of 5% solids sludge from a planned treatment plant. A 1970 report on waste disposal options recommended incineration and, though considered, electrical generation and district heating utilizing waste heat was dismissed. Vehicles enter the facility and enter an eight bay tipping hall. Two bays have restraining chains to secure unstable collection vehichles during tipping. The bunker has two main sections with a small pit for bulky household wastes. Shears are installed for bulky waste which is then discharged into the main sections. Two cactus grabs feed the twin furnaces and air extraction grilles are set above the feed chutes and lower down the bunker to reduce dust. The twin stream incinerator has four rocking grates in each furnace, inclined at 11 degress with a drop between each. Pretreatment and screening equipment designed for the new treatment plant is currently at this plant so that the sludge will be below 6 millimeter particle size. Sludge will be injected with air from the back wall of the furnace over the moving grate. This avoids the problem of wet sludge landing on the grate and 'balling' with refuse. Injection will be at 750 C, ideally at 800 C. (Collins-FIRL)
W77-06125

MODULES PERMIT EASY EXPANSION,
Robert and Co. Associates, West Palm Beach, Fla.
For primary bibliographic entry see Field 5D.
W77-06131

SLUDGE INCINERATOR PROVES A SUCCESS.
For primary bibliographic entry see Field 5D.
W77-06137

SLUDGE, GARBAGE MAY FUEL CALIFORNIA SEWAGE PLANT,
Brown and Caldwell, Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W77-06138

NEW METHODS TREAT SEWAGE PLANT DISCHARGES.
For primary bibliographic entry see Field 5D.
W77-06139

NEW YORK CITY AREA EXAMINES ALTERNATIVE TO OCEAN DUMPING.
Solid Wastes Management, Vol. 19, No. 12, p 18, December, 1976.

Descriptors: *Sludge disposal, *Planning, *Incineration, *Landfills, Environmental control, Ultimate disposal, Treatment facilities, Sewage treatment, Economics, Costs, Toxicity, *Waste treatment.
Identifiers: New York/New Jersey metropolitan area, Pyrolysis.

The Interstate Sanitation Commission of the New York/New Jersey metropolitan area has recommended the alternative of sludge composting and land disposal to ocean disposal of sludge by 1981. It was suggested that sludge which could not be disposed of on land be subjected to pyrolysis. The report indicated that sewage treatment would triple in the area during the next 25 years, and the proposed solution would avoid environmental pollution. The options of pyrolysis and land spreading provide the best balance of environmental, technological, and cost factors when ocean disposal is discounted. Land spreading of composted sludge makes the best use of the sludge, but without ocean dumping, pyrolysis may be an attractive option. Treatment of wastes to remove toxic substances before they enter sewers was also emphasized. Further research on pyrolysis is to be undertaken in the near future. (Collins-FIRL)
W77-06143

EFFECTS OF MUNICIPAL COMPOST AND NITROGEN FERTILIZER ON SELECTED SOILS AND PLANTS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 5C.
W77-06146

SIMULTANEOUS INCINERATION OF REFUSE AND SEWAGE SLUDGE: THE PRINCIPLES AND APPLICATION AT BOWHOUSE, ALLOA, SCOTLAND,
Babtie, Shaw and Morton, Glasgow (Scotland).
J. McL. Fraser.
The Public Health Engineer, Vol. 4, No. 6, p 160-164, November, 1976.

Descriptors: *Incineration, *Sewage disposal, *Sludge disposal, Waste water treatment, Municipal wastes, Gases, Treatment facilities, Liquid wastes, Industrial wastes, Engineering, Sewage sludge.
Identifiers: Refuse incineration, Bowhouse(Alloa Scotland).

The principles involved in simultaneous refuse and sewage incineration at the Bowhouse, Alloa, Scotland, treatment plant are reviewed. A multiple-hearth furnace is described. Circumstances surrounding the choice of plant type for the area were given. These included: developing a means of refuse disposal and disposal of sludge from a treatment plant being built; uncertainty about the composition of sewage-derived sludge though a heavy metals content was expected; and the future possibility of industrial sludge disposal. Reliable cost information has not yet been obtained. Other operational requirements are not tabulated due to a long down-time from a structural fault. (Collins-FIRL)
W77-06147

FRESNO ADOPTS 'OUTSTANDING' MANAGEMENT PLAN,
Jenks and Harrison, Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W77-06148

EARTH, FIRE AND SLUDGE,
The Consulting Engineer, Vol. 40, No. 12, p 41, December, 1976.

Descriptors: *Incineration, *Sludge treatment, *Treatment facilities, *Dewatering, Filters, Temperature, Waste treatment, Waste treatment, Gases, Equipment, Waste disposal, Sludge disposal.
Identifiers: Esher(Surrey England).

The population of Esher, Surrey, England, is served by a sludge incinerator utilizing a fluidized bed combustor. The plant has a dry weather flow of 16,000 cu m/day and incinerator operation occurs during a 7 hour shift each day. Sludge is conventionally dewatered until there is a solids concentration of about 7%. Conditioning by lime and copperas follows with feed into coil-filter drum-type vacuum filters. Sludge cake, with a solids concentration of 22%, is removed and discharged to the incinerator feed pumps. The incinerator has a diameter of 5 meters and a height of 10.3 meters and is constructed of steel with a full-height refractory lining. The sand bed is fluidized by a blower with a capacity of 9,400 cu m/hour. Exit gases are cooled after passing through a scrubber. Heat is removed from the exhaust and used to warm inlet air for the fluidized bed to a temperature of 500C. Ash content ends up as a slurry after mixing with water and is fed to holding ponds for drying. Fuel oil consumption is about 315 liters/hour. Sand consumption averages 150 kg/week. The inert ash is claimed to be useful as fill even though it would be expensive. (Collins-FIRL)
W77-06153

SLUDGE IN A STATE OF PURITY,
For primary bibliographic entry see Field 5D.
W77-06154

EFFECTS OF SEWAGE SLUDGE AND SLUDGE COMPOST APPLIED TO SOIL ON SOME SOIL PHYSICAL AND CHEMICAL PROPERTIES,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5C.
W77-06164

EFFECTS OF TRACE ELEMENTS ON UREASE ACTIVITY IN SOILS,
Iowa State Univ., Ames, Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-06165

PENNSYLVANIA USES LINERS TO CONTROL GROUND WATER CONTAMINATION FROM LANDFILL OPERATIONS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Solid Waste Management.
For primary bibliographic entry see Field 5G.
W77-06172

THE OPERATION OF THE DUMPING AT SEA ACT 1974,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5G.
W77-06176

MOLYBDENUM HAZARD IN LAND DISPOSAL OF SEWAGE SLUDGE,
State Univ. of New York at Binghamton. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5C.
W77-06180

EFFECTS OF ANNUAL AND ACCUMULATIVE APPLICATIONS OF SEWAGE SLUDGE ON ASSIMILATION OF ZINC AND CADMIUM BY CORN (ZEA MAYS L.),
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W77-06181

BENEFITS OF SPREADING WHEY ON AGRICULTURAL LAND,
Kraftco Corp., Glenview, Ill.
For primary bibliographic entry see Field 5D.
W77-06215

DEER HABITAT RESPONSE TO IRRIGATION WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-06280

LEACHATE PLUMES IN A HIGHLY PERMEABLE AQUIFER,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 5B.
W77-06331

WATER SUPPLY AND WASTE DISPOSAL, CULEBRA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico.
D. G. Jordan, and B. K. Gilbert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 517, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 3-76, September 1976. 31 p, 13 fig, 4 tab, 12 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Waste water disposal, *Puerto Rico, Aquifer characteristics, Hydrology, Water quality, Surface-groundwater relationships, Water yield, Available water, Sewage disposal, Sewage treatment, Solid wastes, Sludge disposal, Injection wells, Water quality, Water utilization, Water reuse, Irrigation.
Identifiers: *Culebra(Puerto Rico).

Surface- and ground-water resources of Culebra, Puerto Rico, are small because of periodically meager rainfall and a high rate of evapotranspiration. The annual average surface-water and groundwater yields are about 6 and 20 million gallons per square mile, respectively. The principal aquifers are fractured volcanic rocks with a probable storage capacity of less than 1 percent by volume. Ground-water quality is poor, generally exceeding 1,000 milligrams per liter dissolved solids. Owing to the thin soil cover over much of the islands, prospective areas for solid-waste disposal are limited to a few areas of relatively thick alluvium. With proper treatment, liquid effluent from sewage treatment plants probably could be used for irrigation of pastureland or, with more extensive treatment, for recharge to the aquifer supplying the municipal well field. (Woodard-USGS)
W77-06345

PRIVATE SEWAGE DISPOSAL IN MAINE.
Maine Dept. of Environmental Protection, Augusta.
For primary bibliographic entry see Field 5G.
W77-06371

THE GEOTHERMAL PLANT AT AHUACHAPAN IN EL SALVADOR AND ITS POSSIBLE EFFECTS ON THE WATER QUALITY ON THE BORDER RIVER RIO PAZ BETWEEN EL SALVADOR AND GUATEMALA,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5B.
W77-06382

ATTENUATION OF POLLUTANTS IN MUNICIPAL LANDFILL LEACHATE BY CLAY MINERALS: PART 1-COLUMN LEACHING AND FIELD VERIFICATION,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 5B.
W77-06395

ENVIRONMENTAL STUDY OF THE DISPOSAL OF RED MUD WASTE,
Department of the Northern Territory, Darwin (Australia). Animal Industry and Agriculture Branch.
S. Baseden.
Marine Pollution Bulletin, Vol. 7, No. 1, p. 4-6, 1976. 2 fig, 2 tab, 2 ref.

Descriptors: *Mining, *Mine wastes, *Alkaline water, *Mud, Water pollution, Alkaline earth metals, Research and development, Water quality, Water pollution sources, Environmental effects, Australia, Hydrogen ion concentration, Magnesium, Effluents, *Marine animals, *Benthos, Water pollution effects.
Identifiers: *Red mud, *Bauxite.

Testing indicated that the control of free alkali in red mud was feasible, provided sufficient sea water was introduced into the settling ponds. Under these conditions the supernatant run-off had a pH less than 9 and contained no residual alkali. Magnesium was found to be a useful parameter to include in the pond effluent, since its presence was evidence that free alkali had been removed. The number of biological taxa at each station monitoring in June 1973 did not differ significantly from the mean number of taxa recorded at each station before dumping began. (Katz)
W77-06427

CHLORELLA CULTIVATION IN SLUDGE EXTRACTS,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-06437

INTERNATIONAL COOPERATION FOR THE PREVENTION OF MARINE OIL POLLUTION,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-06537

CERTIFICATION PROCEDURES AND DESIGN AND CONSTRUCTION REQUIREMENTS FOR MARINE SANITATION DEVICES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5D.
W77-06558

TRAIN V COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. (NO AUTHORITY UNDER FEDERAL WATER POLLUTION CONTROL ACT TO REGULATE DISCHARGE OF THE SOURCE, BY PRODUCT AND SPECIAL NUCLEAR MATERIALS COVERED BY ATOMIC ENERGY ACT).
For primary bibliographic entry see Field 6E.
W77-06560

5F. Water Treatment and Quality Alteration

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
For primary bibliographic entry see Field 5D.
W77-06110

FILTRATION RESEARCH IN UK UNIVERSITIES,
Exeter Univ. (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W77-06120

FILTRATION WITH GRANULAR BEDS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-06123

OZONATION OF RECLAIMED WATER.
For primary bibliographic entry see Field 5D.
W77-06141

VIRUS-COAL SORPTION INTERACTION,
Lalbhai Dalpatbhai Coll. of Engineering Ahmedabad (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-06162

EFFECT OF PH ON SOME WATER TREATMENT UNIT PROCESSES (WPLYW ODCZYNU NA NIEKTORE PROCESY OCZYSZCZANIA WODY),
For primary bibliographic entry see Field 5D.
W77-06189

REMOVAL OF LEAD IN WATER TREATMENT (BADANIA NAD USUWANIEM OLOWIU Z WOD),
For primary bibliographic entry see Field 5D.
W77-06190

REMOVAL OF CR(+6) FROM POTABLE WATER BY ION EXCHANGE (USUWANIE ZWIAZKOW CR(+6) Z WODY PITNEJ ZA POMOCA WYMIANY JONOWEJ),
J. Barcicki, L. Pawlowski, T. Kyhnke, and A. Cichocki.
In: Metody Fizykochemiczne Oczyszczczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 69-84, 6 fig, 3 tab.

Descriptors: *Ion exchange, *Separation techniques, *Filtration, Potable water, Chlorides, *Water treatment, Tanks, Sodium compounds, Waste water treatment.
Identifiers: Regeneration, Amberlite IRA-900.

Results of investigations elaborating the ion exchange method for Cr04(--) ion removal from potable water are reported. This technique is based on filtration of water containing 1-3 milligrams of Cr(+6)/cu dm through a column charged with Amberlite IRA-900 and regenerated to the chloride form. Purification of 5,150 bed volumes of water of the concentration of Cr04(--) was done at the single operation cycle. Regeneration was a two-stage process. The first portion of the post-regeneration solution (1.10-1.3 bed volumes) were collected into a tank. Post-regeneration solution from the first operation was passed through the column first, at the second regeneration, and the total effluent was drained to sewage. The fresh solution of 10% NaCl (1.3 bed volumes) was then passed through the column with complete collection in order to use it in the next regeneration cycle. Consumption of 10% NaCl was minimized to 1.3 bed volumes and the NaCl consumption for 1000 cubic meters of treated water amounted to 25 kilograms. (Collins-FIRL)
W77-06193

WATER TREATMENT PLANT PROCESSES AND OPERATIONS,
Environmental Protection Agency, Philadelphia, Pa. Region III.
For primary bibliographic entry see Field 5D.
W77-06198

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5G.
W77-06230

A POTENTIAL ORGANIC DISINFECTANT FOR WATER PURIFICATION,
Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Chemical Engineering, and Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-06250

HYDROGEOLOGY OF THE SPRING WATERS WITH HIGH F CONTENT FROM THE SURROUNDINGS OF TENDUREK VOLCANO, (IN TURKISH),
Ataturk Univ., Erzurum (Turkey).
For primary bibliographic entry see Field 5B.
W77-06379

PROTECTION OF UNDERGROUND DRINKING WATER SUPPLIES - THE GONZALEZ AMENDMENT TO THE SAFE DRINKING WATER ACT,
Openheimer, Rosenberg, Kelleher, and Wheatley, Inc., San Antonio, Tex.
For primary bibliographic entry see Field 5G.
W77-06548

ORGANIC CHEMICAL CONTAMINANTS--CONTROL OPTIONS IN DRINKING WATER (PROPOSED).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-06557

5G. Water Quality Control

FRESNO ADOPTS 'OUTSTANDING' MANAGEMENT PLAN,
Jenks and Harrison, Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W77-06148

AUSTRALIA MAKES IMPRESSIVE PROGRESS IN POLLUTION ABATEMENT.
Water and Pollution Control, Vol 115, No. 1, p 20-21, January, 1977.

Descriptors: *Pollution abatement, *Treatment facilities, *Water pollution control, *Planning, Industrial wastes, Municipal wastes, Tertiary treatment, Waste water treatment, Water reuse, Australia.

Australian pollution control programs have recently become priority concerns. The federal ministry responsible for pollution control has passed more authority to the six Australian States. Low population numbers and coastal development have promoted the nation's swift progress in this area. The Sydney Metropolitan Water, Sewerage and Drainage Board has spent $A200 million annually. Waste treatment expenditures have been a considerable part of this total. Australians have made strides in treating industrial effluents from meat processing, sugar cane milling, food processing, and landfill leachates. The treatment facilities recycle process water for cooling, with make-up water from storm water run-off. Investigations are being made of the possibility of reusing municipal effluents through recharge of groundwater. Municipal treatment facilities are practicing irrigation with processed industrial effluents. Industries regularly recirculate process waters. Sewage farming has become popular with Melbourne treatment plants using aerobic and anaerobic lagoons. Incineration is used in Perth which operates activated sludge plants and primary treatment processes. In Sydney, activated sludge plants, large primary treatment plants, and biological filtration are used. An advanced treatment plant is being constructed in Canberra. It will employ chemical precipitation, dewatering by centrifugation and incineration, effluent denitrification, filtration, chlorination, and dechlorination. Problems with mining industries are serious future concerns. (Collins-FIRL)
W77-06149

PHYSICAL AND ECONOMIC PARAMETERS FOR PLANNING REGIONAL WASTE WATER TREATMENT SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-06171

PENNSYLVANIA USES LINERS TO CONTROL GROUND WATER CONTAMINATION FROM LANDFILL OPERATIONS,
Pennsylvania Dept. of Environmental Resources, Harrisburg. Div. of Solid Waste Management.
W. C. Bucciarelli.
Journal of Environmental Health, Vol 39, No 3, p 184-185, November-December, 1976. 1 tab.

Descriptors: *Linings, *Landfills, *Groundwater, *Water pollution, Waste disposal, Construction, Leachate, Ponds, Canals, Treatment facilities, Economics, *Pennsylvania.
Identifiers: Construction techniques.

The increasing use of landfills for waste disposal has necessitated the use of poorer soils and more sophisticated technology. Liners are used in Pennsylvania landfill operations. Various liners such as clays, asphaltics, rock dykes and man-made materials have been applied to ponds and canals. Sealants have been used to create barriers against fluids and water. Recent applications are variations of conventional construction techniques. Site characteristics, usually groundwater systems, must be used to evaluate the need for liners. The degree of impermeability required determines the type of liner to be used, as well as the economic considerations. Area characteristics must be considered in the decision process. The landfill liner collects leachate to prevent water pollution. In Pennsylvania, all facilities must assure operation of the treatment facility for 10 years after landfilling ceases. There must be an adequate monitoring system to substantiate the integrity of the liner. This can involve subdrains, collection and channelization or mechanical monitoring. Groundwater monitoring wells are a necessity. The natural clays used must be evaluated for their chemical compatibility with the wastes and leachates they will contact. With proper installation and use, the liner concept approaches zero environmental degradation. So far, there has been no evidence of liner failures in Pennsylvania. (Collins-FIRL)
W77-06172

SEPTIC TANK POLLUTION CUT.
For primary bibliographic entry see Field 5D.
W77-06174

THE OPERATION OF THE DUMPING AT SEA ACT 1974,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
M. G. Norton.
Chemistry and Industry, No 19, p 829-834, October, 1976. 4 tab, 8 ref.

Descriptors: *Waste disposal, *Administration, *Legislation, *Standards, Administrative agencies, Adoption of practices, Decision making, Industrial wastes, Ultimate disposal, Water pollution, Oceans, *Water quality standards.
Identifiers: Ocean dumping, *Dumping at Sea Act 1974(UK).

Various aspects and effects of the Dumping at Sea Act 1974 in Britain, are discussed. The Ministry of Agriculture, Fisheries and Food (MAFF), under this Act, is a licensing authority responsible for the protection of the marine environment and the life it supports from pollution. The agency must assess short and long term effects of ocean dumping of wastes and approve the location of dumping areas. In addition, the agency must consider the effects of dumping wastes on other interests and activities in the area, such as fishing, navigation, and mineral extraction. Sewage sludges have been disposed by ocean dumping in greater quantities, largely due to difficulties with other disposal means. Ocean disposal of industrial wastes releases land disposal facilities for more toxic or difficult waste disposal. A reduction in applications for ocean dumping of these wastes may be due to economic factors and to the fee charged for any tests necessary to evaluate effects of ocean dumping. The MAFF is also involved in international schemes to manage ocean dumping through agreements such as the Oslo and London conventions. Various requirements and effects of these agreements are discussed. (Collins-FIRL)
W77-06176

CONSEQUENCES TO INDUSTRY OF THE RECENT WATER LEGISLATION: THE ROLE OF THE REGIONAL WATER AUTHORITY,
Yorkshire Water Authority (England).
D. A. Bailey.
Chemistry and Industry, No 19, p 808-818, October, 1976. 7 fig, 3 tab, 13 ref.

Descriptors: *Administration, *Administrative agencies, *Decision making, Legal aspects, Regulation, Governments, *Waste water treatment, Industrial wastes, Municipal wastes, Sewage effluents, Management, Disposal, Economics, Regional analysis, *Water districts.
Identifiers: *Regional Water Authorities, *Water Act 1973(UK), *Control of Pollution Act 1974(UK).

The functions of British Regional Water Authorities in water supply and management, river pollution prevention, waste treatment and disposal are surveyed. There are 10 Water Authorities which are divided into several divisions. The major purpose of these Authorities is to provide 'pure and wholesome' water for domestic and industrial use. They must also reduce pollution to acceptable levels. Formed by the Water Act of 1973, they are responsible for the collection, treatment, and disposal of waterborne wastes, drainage, and maintenance, improvement and development of fisheries. Problems of economics are the most difficult to overcome. Additional concerns are the degree of 'cleanness' and time involved in achieving relevant goals. In order to set standards for treated effluents, one must consider the effects upon receiving sewers, the influence on treatment processes, and the effects of sewage effluents on rivers and implications for sludge disposal. The Water Act of 1973 and the Control of Pollution Act of 1974 delineate most of the responsibilities and control factors given to the Authorities. Alternatives available to industries include options of disposal methods, pretreatment of wastes, minimization of costs, reduction of water use, and reductions in pollutant loading. (Collins-FIRL)
W77-06177

HOW MUCH POLLUTION CONTROL FOR WHAT PRICE,
Energy Research and Development Administration, Washington, D.C.
R. A. Luken, and E. H. Pechan.
Journal of Soil and Water Conservation, Vol 31, No 6, p 252-253, 260-263, November/December, 1976. 4 tab, 2 ref.

Descriptors: *Pollution abatement, *Legislation, *Costs, *Water quality, *Waste water treatment, Water quality management, Municipal wastes, Industrial wastes, Environmental control.
Identifiers: Public Law 92-500.

The Federal Water Pollution Control Act Amendments (P.L. 92-500) instituted a shift in the American approach to pollution control. Effluent limitations became the control factor with the law. The use of pollution control technology as it became available was required, as well as quality standards. Factors of this law were uniformity, finality, and enforceability. For uniformity, each discharger class, regardless of location, had to meet stipulated effluent limitations. 'Best practicable control technology now available' became the rule of thumb for effluent treatment with target dates set for implementation. Finality involved requiring municipal and industrial sources to meet more stringent limitations at required time intervals. New enforcement powers were granted to control agencies; action could be taken against violators. A commission was established to investigate all technological, economic, social, and environmental aspects of the situation. Costs of treatment for industrial complexes were estimated and cost-effectiveness of treatment was considered. It was shown that national capital costs savings could have amounted to about 50% of a projected $57 billion in 1975 under a cost-effective, rather than uniform, control policy. (Collins-FIRL)
W77-06179

PROCESS TECHNOLOGICAL BACKGROUND REGARDING NEW PROTECTIVE REGULATIONS OF WATER BODIES-RESULTS OF

NITRIFICATION AND PHOSPHORUS ELIMINATION EXPERIMENTS IN ZURICH AND BERN. I. INTRODUCTION AND FUTURE PROSPECTS OF PROTECTIVE PLANNING (VERFAHRENS-TECHNISCHE UNTERLAGEN IM HINBLICK AUF DIE NEUEN GEWAESSERSCHUTZ-ANFORDERUNGEN-ERGEBNISSE DER VERSUCHE UEBER DIE NITRIFIKATION UND PHOSPHORELIMINATION IN ZUERICH UND BERN. I. EINFUEHRUNG UND PERSPEKTIVE IM HINBLICK AUF DIE GEWAESSERSCHUTZ-PLANUNG),
For primary bibliographic entry see Field 5D.
W77-06182

ALGAE SEPARATION FROM OXIDATION POND EFFLUENTS,
Tennessee Technological Univ., Cookesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-06184

CONTROL AND TREATMENT OF WASTE WATER,
F. L. Cross, Jr.
Pollution Engineering, Vol. 9, No. 1, p 99-105, January, 1977. 2 tab, 3 ref.

Descriptors: *Legislation, *Federal Water Pollution Control Act, *Regulation, *Water pollution sources, Waste water treatment, Performance, Evaluation, Analysis, *Water quality standards, Environmental control, Government, Treatment facilities.
Identifiers: PL 92-500.

Changes in water quality legislation and waste water treatment concepts indicate the status of public concern about these matters. Public Law 92-500 of 1972 is the most consequential legislation in this area so far and was conceived due to public pressure for environmental protection. This legislation provided the mechanisms for involving citizens in the decision-making process in meaningful ways. The EPA was required to establish definite and uniform effluent controls for industrial and municipal waste water treatment on a national basis. The Water Pollution Control Act delineated a two-level program for industrial waste treatment. One was the 'best practicable technology', or B.P.T., category comprising the best existing performance methods; the other was the 'best available technology', or B.A.T., category which includes the best economically viable control and treatment measures. The best pollution controls are those performed at the source of the problem. A method of determining pollution problems was suggested. First, there is on-site sampling and laboratory testing and analysis; this if followed by pilot- or bench-scale treatment studies. The data is used to determine the most efficient and economical means of treatment. Primary, secondary, and tertiary treatment processes are described, and tables indicate standards for the various industries delineated in PL 92-500 along with the applications, advantages and disadvantages of the various treatment systems. The probable legislative measures to be taken concerning pollution control by the present Congress are explored and considered in terms of future trends in pollution control. (Collins-FIRL)
W77-06185

COAGULATION OF WATER WITH HIGH CONCENTRATION OF COLOR MATTER (OCZYSZCZANIE WODY O WYSOKIEJ BARWIE),
A. L. Kowal, and Z. Kurowski.
In: Metody Fizykochemiczne Oczyszczania Wod I Sciekow (Referaty Z Konferencii Naukowo-Technicznej), May 6-7, 1976, Lublin, Poland, Marie Curie-Sklodowska University, Lublin, Vol. 1, p 17-23. 4 fig, 1 tab, 5 ref.

Descriptors: *Subsurface waters, *Color, Sludge, Filtration, Sulfur compounds, Chlorides, *Coagulation, *Groundwater.
Identifiers: *Alum coagulation, *Lime coagulation, Permanganate value, Hardness(Water).

Investigations were made of groundwater with very high color (950 ppm Pt) and permanganate value (90 ppm 02). Color removal was by alum and lime coagulation. Doses of alum were near 300 ppm (calculated as aluminum sulfate), and that of lime was 400 ppm CaO. Lime coagulation in a sludge blanket clarifier followed by multilayer filtration produced best color removal (99.5%) and permanganate value (93%). The sulfate or chloride matter with chlorine (700 ppm C12) was used. With lime coagulation, recarbonation was necessary to reduce water hardness. (Collins-FIRL)
W77-06188

EFFECTS OF WASTE DISCHARGES ON WATER QUALITY OF THE SOUTH PLATTE RIVER, DENVER METROPOLITAN AREA,
National Field Investigations Center-Denver, Colo.
For primary bibliographic entry see Field 5A.
W77-06199

A WATER QUALITY STUDY OF THE UPPER CLARK FORK RIVER AND SELECTED TRIBUTARIES,
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5A.
W77-06200

SUMMARY OF PLANT EVALUATION: CITY AND COUNTY OF DENVER'S NORTHSIDE WASTEWATER TREATMENT FACILITY, AUGUST-SEPTEMBER 1972.
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W77-06202

BLEACH MODIFICATIONS TO REDUCE POLLUTANTS,
Lundberg (A. H.), Inc., Mercer Island, Wash.
J. L. Morrison.
In: New Horizons for the Chemical Engineer in Pulp and Paper Technology, S. Prahacs, editor, AIChE Symposium Series, Vol. 72, No. 157, p 67-72, 1976. 13 fig, 21 ref.

Descriptors: *Bleaching wastes, *Chlorination, Water pollution sources, Industrial wastes, Pollution abatement, Pulp and paper industry, Chemical reactions, Toxicity, Color, Costs.
Identifiers: Sequential chlorination, Hypochlorination.

Various methods to reduce pollutants in bleaching procedures were considered. Pollutants from conventional pulp bleaching processes account for 85% of the color pollution and 50% of the BOD components in pulp mill water pollutants. Sequential chlorination and hypochlorination have proved significant in controlling these factors, without requiring major modification to existing mills. For sequential chlorination, chlorine dioxide is added to unbleached pulp immediately prior to chlorination, replacing part of the chlorine usually employed in chlorination. About 0.3% maintains pulp viscosity; a 50% replacement gives the optimum bleaching response, and up to 75% replacement is beneficial when counterflowing the bleach effluent to recovery. It produces lower salt content in the bleach effluent, higher pulp brightness, and better brightness stability. It also protects pulp viscosity, allowing higher chlorination temperatures, higher bleached pulp yield, and reduced caustic soda requirements in extraction. Furthermore, lower effluent color and lower effluent toxicity are effected. When sequential chlorination replaces chlorination, and hypochlorination replaces caustic extraction, the following results occur: chemical costs are slightly increased, capital requirements are minimal, and pulp quality is not affected. (Collins-FIRL)
W77-06225

IWS LOW CHROME EFFLUENT DYEING,
International Wool Secretariat, Ilkley (England). Technical Centre.
For primary bibliographic entry see Field 5D.
W77-06229

WATER QUALITY CRITERIA FOR GREAT LAKES WATERS TO BE USED AS MUNICIPAL AND INDUSTRIAL WATER SUPPLIES,
Canada Centre for Inland Waters, Burlington (Ontario).
D. H. Matheson.
Inland Water Directorate, Scientific Series No. 43, 1975, 43 p., 2 tab, 105 ref.

Descriptors: Standards, *Potable water, *Water quality standards, Great Lakes, Municipal water, Industrial water, Microbiology, Viruses, Industrial wastes, Agricultural runoff, Urban runoff, Municipal wastes, Waste water treatment, United States, Sewage treatment, Effluents, Water supply.

This report provides a frame of reference based on the practical problems and research needs of the industry concerned with the treatment and disposal of wastewater and the provision of suitably treated water for municipal and industrial water supplies. It concentrates on the physical situation of the Great Lakes and interconnecting waterways, where the problems encountered are in many ways very different from those associated with other water sources. The importance of these large bodies of water, as sources of supplies for large and increasing populations and as receiving waters for disposal of treated wastewaters, is paramount. The need for the restoration and preservation of the lakes is the stated objective of the Agreement on Great Lakes Water Quality between the governments of the United States and Canada. (Environment Canada)
W77-06230

EFFECT OF SOME HERBICIDES ON FRESHWATER ALGAE,
Agricultural Research Council, Kidlington (England). Weed Research Organization.
T. O. Robson, M. C. Fowler, and P. R. F. Barrett.
Pesticide Science, Vol 7, p 391-402, 1976. 3 fig, 6 tab, 11 ref.

Descriptors: *Aquatic algae, *Algal control, *Herbicides, Nuisance algae, Fouling, *Diquat, Cutrine, Laboratory tests, On-site investigations, *Cladophora, *Chemcontrol, *Copper sulfate.
Identifiers: Rhizoclonium, Vaucheria, Cultural control methods, *Chemical control methods, Algal mats.

The activity of 12 herbicides was tested against various freshwater algae found in Britain. Three of the most troublesome species (Cladophora glomerata L., Rhizoclonium hieroglyphicum Katz, and Vaucheria dichotoma Ag) were susceptible to methyl-thio-1,3, 3-triazines. Terbutryne and cyanatryn were the most active and both killed C. glomerata and R. hieroglyphicum at 0.05 mg/litre. The concentration of terbutryne had to be increased to 0.1 mg/litre to control V. dichotoma. Asulam and WSCP (2.0 mg/litre) and cutrine (2.0 mg copper ion/litre) had no visible effect on the algae. Diquat (1.0 mg cation/litre) did, however, control C. glomerata and R. hieroglyphicum, although, in natural conditions, the algae quickly recovered after treatment. Success with diquat (2.0 mg/litre) against V. dichotoma in laboratory experiments was not achieved in a field experiment. (Katz)
W77-06277

EFFECTS OF SOME INSECT DEVELOPMENT INHIBITORS ON MOSQUITO LARVAE,
London School of Hygiene and Tropical Medicine (England).
J. R. Busvine, Y. Rongsriyam, and D. Bruno.
Pesticide Science, Vol 7(2), p 153-160, 1976. 3 fig, 1 tab, 21 ref.

Descriptors: *Insecticides, *Mosquitos, *Animal physiology, *Pesticides, Diptera, Insect resistance, Insect eggs, Larvae, Toxicity, Mortality, *Insect control, *Larvicides, Ovicides, Enzymes, Laboratory tests.
Identifiers: *Insect development inhibitors, *Juvenile hormone mimics, Unsaturated fatty acids, Pupae.

The compounds tested were isopropyl (plus or minus) -(E,E)-11-methoxy-3,7-11-trimethyldodeca-2,4-dienoate (ZR 515) and 6, 7 epoxy-3-ethyl-7-methylnonyl 4-ethylphenyl ether (R 20458) (two juvenile hormone mimics); 2,6-di-tert- butyl-4-(xx-dimethylbenzyl)phenol(MON 0585) (which inhibits melanisation during pupation); diflubenzuron and 1-(4-chlorophenyl)-3-(2,6-dichlorobenzoyl)urea (PH 60:38) (which affect chitinisation during moulting); and (E)-oct-2-enoic acid and (E)-non-2-enoic acid (all of which are claimed to have 'teratogenic' effects on insects). The relative potencies of these chemicals were assessed on eggs, larvae and pupae of several mosquito species. Their characteristic delayed harmful effects are described and related to various stages of metamorphosis. (Katz)
W77-06283

LONDON'S STORMWATER PROBLEM,
Greater London Council (England).
For primary bibliographic entry see Field 5B.
W77-06297

PROS AND CONS OF STORM WATER RECHARGE WELLS,
Virginia State Water Control Board, Richmond.
For primary bibliographic entry see Field 5B.
W77-06324

ATTITUDES OF PROFESSIONALS IN WATER MANAGEMENT TOWARD THE USE OF WATER QUALITY INDICES,
American Bar Foundation, Chicago, Ill.
W. A. Thomas.
Journal of Environmental Management, Vol. 4, p. 325-338, 1976. 3 tab., 13 ref.

Descriptors: *Attitudes, *Professional personnel, Surveys, Management, Water quality standards, Bioindicators.
Identifiers: *Water quality indices.

Attitudes of professionals regarding the applicability of water quality indexes were surveyed by a questionnaire distributed to 1800 randomly selected subscribers to 'Water and Sewage Works.' Useful responses were received from 226 individuals, representing a broad range of professional training (engineering, chemistry, business, and science), employers (state, local and federal government, industry, consulting firms, and university), and occupational designations (engineering, sales or administration, and science or teaching). Results indicated that water management professionals generally agreed that present methods for reporting water quality are inadequate, that politicians and the public do not really know what is meant by water pollution, and that a need exists for uniform and objective descriptors of water quality. However, they disagreed on the relative merits and limitations of numerical water quality indices, with some clear delineations according to professional training, type of employer, and occupational responsibility. The main disadvantages perceived were potential misinterpretation and misuse of an index, and loss of techuical detail as a result of aggregating data. (Luedtke-Wisconsin)
W77-06353

1976 MINNESOTA WATER QUALITY INVENTORY: REPORT TO CONGRESS SECTION 305 (B).
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5A.
W77-06355

INLAND LAKE WATERSHED ANALYSIS,
Michigan Univ., Flint. Dept. of Physical Geography.
W. M. Marsh, and T. E. Borton.
Michigan Dept. of Natural Resources, Lansing, Report May 1976. 92 p. 29 fig., 4 tab., 10 ref.

Descriptors: *Comprehensive planning, *Water quality, *Lakes, *Watershed management, Water management(Applied), Michigan, Planning, Lake shores, Monitoring, Land use, Analytical techniques.
Identifiers: *Problem identification and ranking.

The relationship between inland lakes and their watersheds forms the basis for an approach to planning and management associated with lake water quality. The study objectives are to establish a set of non-technical methods that can be used to: (1) build an information base on inland lake watersheds; (2) analyze watershed data and information for planning and management purposes; (3) establish planning and management guidelines for lake watersheds. In the first of four reports sections, discussion is centered on a hypothetical lake and watershed whose characteristics are similar to medium-size Michigan lakes. The second section identifies a set of watershed and shoreline characteristics which can be monitored and systematically recorded by local residents, land owners and officials, for later use an an information data base. The third section describes an approach to analyzing lake watersheds in terms of identifying critical areas and ranking sub-basins for planning and management attention. The fourth section offers a set of guidelines defined separately for shorelands and sub-basins. Shorelands are classed into three orders, each of which carries a specified development capacity. Six guidelines are defined for sub-basins and these are designed to minimize the influence of sub-basin drainage on lake water quality. (Harris-Wisconsin)
W77-06356

MAINE LAKE WATER QUALITY STRATEGY.
Maine Dept. of Environmental Protection, Augusta.
For primary bibliographic entry see Field 5C.
W77-06357

POLICY REGARDING THE USE OF COPPER COMPOUNDS AS AQUATIC HERBICIDES IN MAINE.
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
Report February 1976. 13 p. 1 tab., 44 ref.

Descriptors: *Copper sulfate, *Toxicity, *Maine, Rates of application, Lethal limit, Fish, Hardness(Water), Alkalinity, Aquatic animals, Copper compounds, Algicides, Toxins, *Algal control.
Identifiers: Bioaccumulation.

It is recommended that application of copper compounds for algae control be discontinued in Maine because they are extremely toxic, non-selective and non-biodegradable. Extensive use of copper sulfate in Maine's soft waters has not effected long-term control and, in some cases, no short-term control of algae. Even the application of a proper level of copper presents a potential hazard as sedimented copper may be accumulated by benthic organisms. Concentrations of the algicide ranging from 2-2000,000 ppb have been reported lethal to various fishes in different waters, depending on fish species, age, dissolved oxygen, temperature, lentic or lotic environments, amount of oranic matter present, and carbonats. Some unknown or unsuspected factor(s) may also account for the many toxicity variations. The toxicity to fathead minnows, bluegills, brown bullheads, rainbow trout, Atlantic salmon, and brook trout; and to Daphnia, snails, amphipods, crayfish and mayflies are documented, giving exposure, lethal limit, copper concentration and total alkalinity and total hardness. Chonic effects on aquatic animals are also discussed. (Auen-Wisconsin)
W77-06366

REPORT ON RESULTS OF RAINV RIVER FISH TAINTING QUESTIONNAIRE.
Minnesota Pollution Control Agency, Roseville. Water Quality Div.
January 1976. 53 p. 19 tab., 3 append.

Descriptors: *Odor, *Taste, *Fish, *Surveys, *Minnesota, Pulp wastes, Water pollution effects, Fishing, Organoleptic properties, Attitudes.
Identifiers: *Rainy River(Minn), Public opinion sampling.

The methodology and results are given of a survey of a large population of fishermen who live in the vicinity of the Minnesota section of the Rainy River who were asked whether they noted taste and odor problems in their catches, and when and where these problems were most severe. The geographical scope of the survey reflected both the residential and occupational characteristics of the residents, particularly those occupations relating to the pulp and paper mills industry, and how their affiliations with the major polluters affect their evaluation. The survey was based on three river segments, from its headwaters in Rainy Lake to its mouth at the Lake of the Woods. A majority of the fishmen who returned their questionnaires said they thought their fish tasted or smelled bad, with more complaints from the Sault Rapids area than from any other portion of the river. Fish caught in the spring, especially during May and June, were identified as most likely to have taste and odor problems. Significant differences in the responses between three segments of the river illustrated that geographical residence played a strong role in the responses. Comments made by 68% of the respondents indicated that the majority felt that pollution and/or fish tainting and reduction in spawning are caused by pulp and paper mills at International Falls, Minnesota and Fort Frances, Ontario. (Auen-Wisconsin).
W77-06367

PRIVATE SEWAGE DISPOSAL IN MAINE.
Maine Dept. of Environmental Protection, Augusta.
July 1974. 29 p.

Descriptors: *Domestic wastes, *Rural areas, *Maine, *Sewage treatment, *Sewage disposal, Waste treatment, Filters, Disinfection, Septic tanks, Biological treatment, Capital costs, Operating costs, Secondary treatment.
Identifiers: Private sewage disposal.

To help homeowners comply with Maine's regulation banning untreated waste discharges into waters after October 1, 1976, a guide for residences that cannot be connected to a municipal treatment system prescribes acceptable domestic waste treatment alternatives for both seasonal and year-round residences. Choices of treatment are prescribed for discharges into coastal waters, large flowing rivers, small streams, lakes and ponds. Alternative sewage systems described include septic tank arrangements, holding tanks, mechanical treatment units and waste separation. Directions are given as to how to determine the best type of suitable disposal and/or treatment system, including illustrations and descriptions of the operation and installation of various units. A chart lists ad-

vantages and disadvantages of each method, gives the approximate initial installation costs (in 1974) and operating costs. In dwellings used only occasionally, in areas limited in water or electricity, or in domiciles located on lakes or ponds (which cannot receive treated effluents), various methods of treating human waste are suggested. (Auen-Wisconsin).
W77-06371

PROPOSED TROPHIC CLASSIFICATION OF THE GREAT PONDS OF MAINE,
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
For primary bibliographic entry see Field 5C.
W77-06372

CLASSIFICATION OF SURFACE WATERS.
Maine Dept. of Environmental Protection, Augusta.
Maine Revised Statutes Annotated, Title 38, Chapter 3, October 1975. 53 p.

Descriptors: *Surface waters, *Water quality standards, *Maine, *Classification, Lakes, Rivers, Tidal waters, Streams, Ponds, Legislation, Estuaries, Regulation, Laws.

Water quality standards for inland and tidal waters are prescribed under Title 38 of Maine's Revised Statutes delineating the degree of recreation usages, industrial uses, potable water supply, and those suitable for wildlife and fish. Freshwater classifications range from Class A, the highest, through Classes B-1 and B-2, to Classes C and D, each detailing permissible in-class extent of dissolved oxygen content and coliform bacteria. Restrictions common to all classifications are that they be free from sludge deposits, solid refuse and floating solids such as oils, grease or scum; that there shall be no disposal of substances which impart color, turbidity, taste or odor, nor such matter that would alter the temperature or the hydrogen ion concentration such that would be harmful to aquatic life. No discharges are allowed of radioactive matter, harmful chemicals, or inadequately treated sewage. The classifications entail the range of compatible uses, such as contact sports, potable water supply after treatment, industrial uses, wildlife habitats and fish. Tidal and marine water classes include SA, SB-1, SB-2, SC and SD and in addition to the designated standards for fresh waters, include suitability for shellfish, with the Class SD allocated for power generation, navigation, industrial process or cooling waters, and for fish migration. Each body of water in the state is listed accompanied by the appropriate classification. (Auen-Wisconsin)
W77-06373

HISTORY OF THE PHOSPHATE DETERGENT BAN IN INDIANA,
Manchester Coll., North Manchester, Ind.
W. R. Eberly.
Proceedings of the Indiana Academy of Science, Vol 84, p 405-414, 1975. 55 ref.

Descriptors: *Detergents, *Indiana, *Legislation, *Phosphates, *Eutrophication, History, Reviews, International Joint Commission, Regulation, Pollution abatement.
Identifiers: Phosphate detergent bans.

The 1971 decision by the Indiana State Legislature to limit phosphate in laundry detergents, and the controversy generated by this move, are reviewed against a background of 50 years of research on the relationship of algae growth and dissolved phosphates in water. The complete disappearance of oxygen in the central basin of Lake Erie in 1964 triggered studies of the Great Lakes by the United States-Canada International Joint Commission with the view of eliminating eutrophication. The Federal Water Pollution Control Administration's committees and a paper issued in 1966 proposed research on substitution of other chemicals for phosphate. However, the Joint Industry/Government Task Force on Eutrophication formed by the Interior Department, and heavily staffed by detergent manufacturers, emphasized phosphate removal from waste waters rather than detergent reformulation. Because the U. S. Congress failed to act in concert with the Canadian Government, the various states which surround the Great Lakes passed legislation limiting the amount of phosphorus in detergents that could be used in those areas. Pressured from the detergent industry to repeal or amend the state/local laws failed and now the detergent companies are selling non-phosphate detergents. The Second Annual Report on Great Lakes Water Quality indicates that their water quality has improved since 1971 and recommends that the United States institute legistation similar to the Canadian law restricting phosphorus levels in detergents. (Auen-Wisconsin)
W77-06378

WATER POLLUTION FROM INDUSTRIAL SOURCES IN SWEDEN AND RECENT TRENDS TO PREVENT IT,
Swedish Water and Air Pollution Research Lab., Goteborg.
L. Landner.
Report IVL B 306, June 1976. (Presented at the 24th Iranian Medical Congress on 'Environmental Health' September 5-12, 1975, Ramsar, Iran). 9 fig, 1 tab.

Descriptors: *Industrial wastes, *Water pollution control, *Legislation, *Foreign countries, Technology, Pulp and paper industry, Mineral industry, Chemical industry, Water reuse, Permits, Sites, Mercury, Polychlorinated biphenyls, Research facilities, Oil wastes, Recycling, Pollution abatement.
Identifiers: *Sweden, Energy conservation, Resource conservation, Ore dressing industry, Steel industry, Industry-government cooperation, Chlorine industry, Product recovery, Waste oil reuse, Waste utilization.

Technological innovations resulting from cooperative industry-government research in Sweden to restrict pollution by the pulp and paper industry, ore dressing plants, the chlorine industry's mercury discharges, the steel industry, and waste reuses are described. To facilitate reuse of waste materials, the Nordic Organization for Waste Exchange functions as a clearing house for buyers. A method of removing polychlorinated biphenyls from waste oil in an ammonia plant is detailed. The Swedish Environment Protection Act functions under a permit system defining individual conditions. It requires permits to locate any industrial activity and evaluates plant sites in the perspective of environmental protection, economics, infrastructure, and labor market policy. Detailed plans must be presented to the Franchise Board for the Protecion of Environment to define discharges to water and air; Board decisions are reviewed by other regulatory bodies and public hearings. The Board's permit is valid for then years, contingent on technical developments in pollution abatement. Specific legislative provisions and grants are applicable to old and existing industrial plants. The Swedish Product Control Act places burden of proof on the handler, producer, or seller of any chemical product by requiring that he must know the product's composition and the extent of its environmental, public health and waste disposal threat. (Auen-Wisconsin)
W77-06383

LAKE TRUMMEN RESTORATION PROJECT. I. WATER AND SEDIMENT CHEMISTRY,
L. Bengtsson, S. Fleischer, G. Lindmark, and W. Ripl.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 1080-1087, 1975. 5 fig., 2 tab., 8 ref.

Descriptors: *Aquatic weed control, *Dredging, Sediments, *Water chemistry, Foreign research, Phosphorus, Nitrogen, Trophic level, *Lake sediments, Foreign countries.
Identifiers: *L... restoration, *Lake Trummen(Sweden), Sedin... chemistry.

Restoration measures such as suction dredging and macrophyte elimination were applied in 1970-71 to Lake Trummen, a small, shallow body of water in southern Sweden that was previously severely polluted. The restoration resulted in a significant change in water quality. Phosphorus and nitrogen decreased drastically and the role of the sediment in recycling nutrients has been minimized. The surface sediment is now oxidized, brown and consolidated, is less organogenic, and contains less nitrogen and phosphorus. The decrease in phosphate concentrations in the interstitial water is striking. Ammonium in the interstitial water has decreased to less than half its 1969 concentrations. Under anoxic conditions the release from the new surface sediment is much lower than from the fromer surface sediment. Phosphate is now usually at levels below 10 micrograms P/l and particulate phosphorus fluctuates together with organic soluble phosphorus around a ratio of 1. Laboratory experiments and field studies indicate that the denitrification activity at the new sediment surface is rather low. No gas production from the new sediment has been observed. Data comparisons in the study are also given for before and after the restoration for ammonia levels, organic nitrogen, nitrate concentrations, nitrite, soluble reactive silica distribution, alkalinity, inorganic carbon, organic carbon and ionic composition. (See also W77-06388 and W-06389) (Harris-Wisconsin)
W77-06387

LAKE TRUMMEN RESTORATION PROJECT. II. BACTERIA, PHYTOPLANKTON AND PHYTOPLANKTON PRODUCTIVITY,
G. Cronberg, C. Gelin, and K. Larsson.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 1068-1096, 1975. 8 fig., 1 tab. 16 ref.

Descriptors: *Reclamation, *Aquatic bacteria, *Phytoplankton, *Primary productivity, Foreign research, Biomass, Cyanophyta, Photosynthesis, Trophic level, Dredging.
Identifiers: *Lake restoration, *Lake Trummen(Sweden), Macrophyte control.

Restoration measures such as suction dredging and macrophyte elimination were applied in 1970-71 to Lake Trummen, a small, shallow body of water in southern Sweden that was previously severely-polluted. The number of aerobic heterotrophic bacteria in the water did not change after the restoration. A marked decreased of protein, starch and glucose decomposing bacteria was observed. In the sediment all the examined physiological groups of bacteria were concentrated to the uppermost 5 cm, where most of them occurred in the same number as before. In connection with the restoration the mean biomass of phytoplankton from June until September decreased from 75 to 10 mg/l due to the lower abundance of blue-green algae. The productivity structure of the phytoplankton communities was changed. In spite of the decrease of the mean annual productivity from 375 to 225 grams C per square meter, the yearly productivity of algae with a mean diameter of less than 45 millimicrons did not change. More than 60% of the annual phytoplankton production was photosynthesized by algae less than 10 millimicrons. The diversity of phytoplankton increased when the fertility of the lake decreased. (See also W77-06387 and W77-06389) (Harris-Wisconsin)
W77-06388

LAKE TRUMMEN RESTORATION PROJECT. III. ZOOPLANKTON, MACROBENTHOS AND FISH,
G. Andersson, H. Berggren, and S. Hambin.
Verhandlungen Internationale Vereinigung Limnologie, Vol. 19, p. 1067-1106, 1975. 5 fig., 3 tab., 11 ref.

Descriptors: *Dredging, *Reclamation, *Zooplankton, *Benthos, *Fish populations, Fish types, Fishkill, Food chains, Foreign research, Nutrient removal.
Identifiers: *Lake restoration, *Lake Trummen(Sweden), Macrophyte control.

Restoration measures were applied in 1970-71 to Lake Trummen, a small, shallow body of water in southern Sweden that was previously severely polluted. The most striking effect of the restoration on the zooplankton community is the decline in the number of most species, although the numerical proportions among most species are largely unchanged. Among 11 species, only Keratella cochlearis increased. K. quadrata, Brachionus calyciflorus, B. angularis, Anuraeopsis fissa, Trichocerca pusilla, Filinia longiseta, Daphnia longispina, D. cucllata, Bosina longirostris and Chydorus sphaericus all decreased and Brachionus budapestinensis disappeared. The most evident qualitative change among macrobenthos was the appearance of Anodonta cygnea in even the deepest parts of the lake (about 2.5 meters) where small individuals of this species can now be found. Surprisingly, the dredging did not result in any profound decrease in the number of benthos as a whole. At least for the chironomids, this might be due to the mobility of the larvae. Whereas the biomass of the fish community was very large before the restoration, the reclamation work combined with a hard winter in 1970 seriously reduced catches of most of the lake's species. These declines, some of which were recovering by 1973 and 1974, were probably due to disturbances in the food chain caused by the restoration. (See also W77-06387 and W77-06388) (Harris-Wisconsin)
W77-06389

INVOLVING THE PUBLIC IN LIMNOLOGY--AN APPROACH TO COMMUNICATION,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. Shapiro, J. B. Lundquist, and R. E. Carlson.
Verhandlungen International Vereinigung Limnologie, Vol. 19, Part II, p. 866-874, 1975. 6 fig., 1 tab., 3 ref.

Descriptors: *Water quality, On-site data collections, *Lakes, *Minnesota, *Secchi disks, Baseline studies, Basic data collections, Field data, Opacity, Instrumentation, Monitoring, Limnology, Trophic level, Attitudes.
Identifiers: *Citizen participation, *Volunteer programs.

A water quality screening program is described, in which interested individuals, groups and organizations were enrolled in a volunteer program to take Secchi disk readings at approximately 250 of Minnesota's 12,000 lakes and to mail in the monitored data to a program center. The effort was devised as an answer to potential logistical and organizational problems that would be otherwise involved in any comprehensive effort to gather limnological data on even the 2,500 most important of the state's lakes. A single diagnostic parameter was sought that could yield much of the information necessary to define a lake's trophic status, and water transparency was accordingly selected for mass measurement. To reduce expenses, it was decided to locally manufacture simple 20-centimeter diameter Secchi disks of slightly unconventional shape. These were supplied to volunteers with waterproof instructions and with 25 feet of rope marked off at 6-inch intervals. Volunteers were obtained as a result of a publicity campaign in 35 newspapers published in 10 of the state's 87 counties. Efforts are being made to extend the program to other areas of the state. Data is fed back by means of simple reply cards with provision for weekly disk readings throughout the summer. The various uses of the data to date are described. (Harris-Wisconsin)
W77-06392

PROCEEDINGS OF THE CONFERENCE ON NONPOINT SOURCES OF WATER POLLUTION: PROBLEMS, POLICIES AND PROSPECTS.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-06396

INTEREST GROUP PERCEPTIONS OF DEVELOPMENT ISSUES IN TIDEWATER VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W77-06400

OIL SLICK SAMPLING APPARATUS AND METHOD,
Calspan Corp., Buffalo, N.Y. (Assignee).
For primary bibliographic entry see Field 5A.
W77-06444

ABSORBENT PRODUCTS FOR HYDROCARBONS,
Societe Rhodiaceta, Paris (France). (Assignee).
P. Porte.
U.S. Patent No. 3,990,970, 3 p, 8 ref; Official Gazette of the United States Patent Office, Vol 952, no 2, p 761, November 9, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, *Water quality control, *Absorption, *Polymers, Organic compounds, Plastics.
Identifiers: Hydrophobic material, Oleophilic material, *Absorbents.

A pulp, i.e. an amorphous mass obtained by precipitation by means of a non-solvent, of an artificial or synthetic polymer, preferably a polyamide or polyester, is used as an absorbent for oil floating on water. Advantageously the pulp is coated with 1 to 5% of its weight of a hydrophobic and oleophilic material, especially a long chain paraffin or chlorinated paraffin. Because of their absorbency towards hydrocarbons, which is very high and their good absorption selectivity, the pulps of this invention are of great interest and great efficiency for the absorption and agglomeration of layers of petroleum products spread on the surface of seas, oceans, and waterways. For this purpose, they can be packed either in the form of slubs in threads, or in the form of bricks, the pulp being held together by agglomeration by means of a phenolic binder. (Sinha-OEIS)
W77-06456

RIGGING SYSTEM FOR AN ENDLESS OIL MOP,
Oil Mop, Inc., Belle Chasse, La. (Assignee).
C. McLellan.
U.S. Patent No. 3,990,975, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 952, no 2, p 762, November 9, 1976.

Descriptors: *Patents, *Oil spills, *Oil pollution, *water pollution treatment, Water quality control, Water pollution control, Adhesion, Boats.
Identifiers: Rigging, Oil mops.

In combination with a vessel and an endless oil mop, oil is collected from the surface of a body of water by the adherence of the oil to the oil mop. The endless oil mop driven through an engine or motor driven wringer mechanism, makes multiple passes over and through an oil contaminated body of water from the deck of a vessel. This is accomplished by using sampson posts on the deck of the vessel and connecting spars to the posts and suoyantly supporting the free ends of the spars and mounting mop pulleys at the end of each spar and one pulley between the spars on the side of the vessel at the water line. (Sinha-OEIS)
W77-06459

CYCLONE WITH PLURAL PERIPHERAL DISCHARGE TUBES,
For primary bibliographic entry see Field 5D.
W77-06460

NONPOINT SOURCES AND PLANNING FOR WATER POLLUTION CONTROL,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W77-06461

EXPERIMENTAL STUDY OF WIND EFFECTS ON REAERATION,
National Bureau of Standards, Washington, D.C. Fluid Meters Section.
For primary bibliographic entry see Field 2L.
W77-06520

THE IMPACT OF PUBLIC LAW 92-500 ON MUNICIPAL POLLUTION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-06532

LEGAL CRITERIA NEEDED TO PROVIDE EFFECTIVE INSTRUMENTS FOR INVENTORY, DEVELOPMENT, CONSERVATION AND USE OF WATER RESOURCES AT THE LOCAL LEVEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Commission.
For primary bibliographic entry see Field 6E.
W77-06533

THE EFFECTS OF DREDGING ON WATER QUALITY IN THE NORTHWEST,
Environmental Protection Agency, Seattle, Wash. Region X.
G. O'Neal, and J. Sceva.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-228 533, Price codes: A08 in paper copy, A01 in microfiche. July 1971. 158 p, 14 fig, 8 tab, 2 append.

Descriptors: *Pacific Northwest US, *Dredging, *Bottom sampling, *Spoil banks, *On-site data collections, Bottom sediments, Dissolved oxygen, Federal government, State governments, Washington, Oregon, Administrative agencies, Sediments, Sampling, Chemical analysis, Data collections, Laboratory tests, On-site investigations, On-site tests, Soil analysis, Testing, Permits, Columbia River.
Identifiers: Administrative regulations, Willamette River.

In the Pacific Northwest dredging of rivers and harbors is an extensive activity. The material dredged can have a serious detrimental effect on both water quality and the aquatic environment. An act of Congress provides that a permit be obtained before dredging operations begin. Such applications are submitted to the Federal and State environmental and fishery agencies who have jurisdiction in the areas to be dredged. In order to decide intelligently whether or not a permit should be granted it is necessary to have information on river bottom materials, operating characteristics

of dredging equipment, and spoil disposal practies. This study provides such information. Topics analysed include spoil disposal in locations determined on an ad hoc basis with no long term plan available. The resulting disturbance of bottom materials reduces dissolved oxygen levels. The study recommeds that zoning should be initiated in rivers, and dredging completely prohibited in certain areas as well as long-term land disposal sites made available for dredge spoil. In addition it is suggested that applicants for dredging permits provide data on the chemical and physical characteristics of the material to be dredged. Regulatory agencies are also urged to monitor selected projects to insure compliance with permit requirements. (Moorhouse-Florida)
W77-06535

INTERNATIONAL COOPERATION FOR THE PREVENTION OF MARINE OIL POLLUTION,
Miami Univ., Fla. Sea Grant Institutional Program.
A. W. Anderson, and W. K. Bissell.
Available from Information Services, Sea Grant Program, University of Miami, 1541 Brescia, Coral Gables, Florida 33124, $3.00. Sea Grant Technical Bulletin No. 33, September, 1975. 145 p. 04-5-158-14.

Descriptors: *Oil pollution, *Oil spills, *Oil industry, *Treaties, International law, Legal aspects, International waters, Law of the sea, Water pollution, Water pollution control, Oil, Legal aspects, Coast Guard regulations, Waste disposal, Regulation, Water pollution sources.
Identifiers: *Petroleum, *Petroleum derivatives, *Vessels, *Vessel source pollution, Coastal zone, Marine ecosystem, Marine environment.

The problem of oil pollution may be divided into three elements: prevention, control and liability. The 1954 International Conference on the Pollution of the Sea by Oil has been ratified by sixty-one nations which mane over sixty per cent of the world's oil tanker tonnage, but important amendments still await acceptance by two-thirds of these countries. The United States has taken steps to implement all provisions of the treaty for U.S. vessels by 1978. Traumatic vessel source discharges cause up to eighty percent of the world oil pollution problem. International efforts need to be undertaken for uniformity of procedure, equipment and regulation in the transportation of oil to reduce the amount of oil spilled as a result of such discharges. When prevention measures fail, international cooperation is necessary in developing and using strategies designed to control the spills. After a spill has occurred, the question of assessing and enforcing liability must be resolved among nations having diverse interests and philosophies. The authors discuss the consequences of international oil pollution and the efforts of various international organizations to deal with the problems. (Sloan-Florida)
W77-06537

THE COLORADO RIVER SALINITY PROBLEM--OLD APPROACHES TO A NEW ISSUE,
R. A. Hennig, and J. B. Olson.
Land and Water Law Review, Vol IX, No 2, p 459-79 (1976). 1 tab.

Descriptors: *Colorado River, *Colorado River Basin, *Mexico, *Salinity, *Saline water, Project planning, Projects, International law, Interstate rivers, Interstate, International commissions, Rivers, River basins, River basin development, Water law, Water supply, Water rights, Water quality, Treaties.

The Colorado River has historically had salinity concentrations higher than most other major rivers. Moreover, the level of salinity has been increasing yearly, mainly as a result of man's activities in the Colorado River Basin. Evaluated in this article are present and planned salinity control programs. The authors examine past patterns of policy making and problem-solving, and how these techniques are being carried over into the attempted management of the salinity problem. The problem became worse in 1961 because of the completion of a drainage canal which resulted in tripling the salinity of the water being delivered into Mexico. Inter-governmental measures were taken to decrease the salinity. The authors contend that the United States' solution to the salinity problem was 'based on dollars and not on water'. The suggestion is made that the federal government's approach was muddled by the following policy approaches: primacy of the rural-reclamation ethic; protection of vested private water rights; protection of future development potential; federal assumption of costs. The problem-solving patterns are repetitious, thus leading to potentially continued disputes. The success of on-going efforts to control the salinity level will determine whether future disputes materialize. Increased federal intrusion will be necessary to resolve the effects of the salinity problem on Mexico and on the lower basin states. (Welch-Florida)
W77-06540

ENFORCEMENT OF OIL POLLUTION LEGISLATION,
M. A. Brown.
The Modern Law Review, Vol 39, No 2, p 162-68 (March 1976).

Descriptors: *Oil pollution, *Law enforcement, *Jurisdiction, *Ships, Legislation, Oil, Oil spills, Penalties(Legal), Insurance, Compensation, Oceans, Legal aspects, Water pollution sources, Foreign countries, Governments, Canada, Water pollution control.
Identifiers: *Great Britain, Fines, Liability.

The British oil pollution law is enforced only when there is substantial pollution or when the pollution, however minimal, was caused by substantial negligence. The degree of pollution determines the size of the fine assessed by the magistrate. Severe pollution may be exempt from prosecution if it is caused by collision, stranding or explosion. A major problem with the British law arises when the pollution is caused by a foreign-owned ship since the ship owner is not likely to be available for prosecution. The fine must then be levied against the ship's master and must be based on his means and his personal responsibility for the pollution rather than related to the extent of the pollution. The author examines several methods currently utilized by the shipping community to pay for oil pollution damages. In addition, he discusses the Canadian law which places responsibility on the ship itself in an in rem action. (Capehart-Florida)
W77-06543

SHORELINE MANAGEMENT AND BOATING - CAN THE INDUSTRY SURVIVE. (REPORT ON THE FOURTH MARINE RECREATION CONFERENCE).
For primary bibliographic entry see Field 6E.
W77-06544

POLLUTION--NO PRIVATE COMPENSATION FOR INVASION OF PUBLIC RIGHTS ABSENT PARTICULAR DAMAGES, BURGESS V THE TAMANO, 1973 A.M.C. 1939 (D ME 1973),
J. P. McMahon.
Journal of Maritime Law and Commerce, Vol 5, No 3 p 539-44 (April 1974).

Descriptors: *Oil spills, *Legal aspects, *Civil law, *Law of the sea, Jurisdiction, Negligence, Public rights, Cost allocation, Water policy, Pollutants, Water pollution, Fouling, Oil pollution, Oil, Water pollution sources, Water law, Oceans, Regulation, Judicial decisions, Penalties(Legal), Damages, Compensation.
Identifiers: *Nuisance(Legal aspects).

The liability of a shipowner for damage caused by oil spill pollution is unclear both general maritime law and state law. Recent cases indicate that private parties may not recover compensation for damage to public rights unless the plaintiff can show that he sustained special damages not suffered by the general public. These special damages must be different in kind, not simply grater in degree. Losses to fisherman unable to fish in polluted waters are recoverable, generaly, but losses to merchants because tourists don't come to fouled beaches are not recoverable. Loss of use of privately-owned pleasure craft is not recoverable, but actual damage to such craft could be recovered. Further conflicts exist as to whether federal maritime law or state substantive law applies. Absent an element of taking of property, general concepts of state nuisance law are applied to claims for compensation. Since nuisance is a result, not a cause, a distribution is made without reference to infringement of a private interest to identify those who have standing to recover for pollution damages. (Mollor-Florida).
W77-06546

PROTECTION OF UNDERGROUND DRINKING WATER SUPPLIES - THE GONZALEZ AMENDMENT TO THE SAFE DRINKING WATER ACT,
Openheimer, Rosenberg, Kelleher, and Wheatley, Inc., San Antonio, Tex.
S. V. Wheatley, and R. Castaneda.
St. Mary's Law Journal, Vol. 8, No. 1, p. 40-68 (1976).

Descriptors: *Aquifers, *Potable water, *Water quality standards, *Texas, *Legislation, Administration, Local governments, Financial feasibility, Administrative agencies, Federal government, State governments, Regulation, Water rights, Projects, Water pollution, Water management(Applied), Public health, Governmental interrelations, Water demand, Water purification, Freshwater.
Identifiers: *Safe Drinking Water Act, *1974 Gonzalez Amendment.

National drinking water standards were initially established by the Safe Drinking Water Act. This Act was intended to give the state a primary role in implementing and enforcing national drinking water standards. Its purpose was to stimulate and nurture local control and responsibility for the enforcement of these standards. The 1974 Gonzalez Amendment to the Act provides that areas which depend on aquifers as the sole or principal source of water and which, if contaminated, would create a significant public health hazard, may be denied federal funding for projects which may contaminate the aquifer. Consequently, the amendment raises the possibility that a score of federal projects located in a Texas aquifer area may be denied federal financial assistance. The provision giving the Environmental Protection Agency Administrator the threshold level of discretion to determine if the amendment is applicable runs counter to the Safe Drinking Water Act's policy of increased reliance on local pollution control agencies. A more prudent policy for the Environmental Protection Agency to pursue is to work closely with state and local agencies to insure that the main provisions of the Safe Drinking Water Act are carried out with maximum state initiative and responsibility. (Rieck-Florida)
W77-06548

THE COMPULSORY SELF-DISCLOSURE AND PENALTY PROVISIONS OF THE 1972 AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT: CATCH-22 AT SEA,
C. Broome.
Tulane Law Review, Vol 49, p 1124-38 (1975).

Descriptors: *Federal Water Pollution Control Act(FWCA), *Water Quality Act, *Oil, *Oil pollution, *Oil spills, Offshore platforms, Rivers and Harbors Act, Constitutional law, Water law,

Water pollution, Legislation, Legal aspects, Regulation, Administration, Administrative agencies, Judicial decisions, Administrative decisions.
Identifiers: Vessels, *Hazardous substances, *Federal Water Pollution Control Act Amendments of 1972.

The 1972 Amendments to the Federal Water Pollution Control act (FWPCA) established a comprehensive scheme of liability for clean-up costs necessitated by the spillage of oil or other hazardous substances from vessels, onshore facilities, or offshore facilities. Section (b)(5) of the Act requires any person in charge of such vessel or facility to report any spillage; failure to do so may subject the offender to criminal penalties of imprisonment up to one year and a fine of $10,000. Section (b)(6) of the Act states that the owner or operator responsible for the spill shall be assessed a civil penalty of not more than $5,000. A 1974 federal district court case, United states v. LeBeouf Brothers Towing Co., held the interaction of these two sections to be constitutionally impermissible as violating the Fifth Amendment self-incrimination clause. The author discusses the case law which deals with the characterization of penalties as 'civil' or 'criminal', concluding that the wording of a statute is not necessarily determinative of this characterization when considered with the intent, and that the Supreme Court will probably uphold the decision of the district court in the LeBeour case. (Sloan-Florida)
W77-06549

WATER QUALITY CONTROL AND TAX INCENTIVES: A PANACEA FOR WATER POLLUTION,
Florida Univ., Gainesville. Coll. of Law.
D. C. Jones.
Available from Eastern Water Law Center, University of Florida, College of Law, Gainesville, Florida 32611, for $1.40. Winter 1971, 27 p.

Descriptors: *Water quality control, *Taxes, *Tax rates, *Pollution taxes(Charges), *Assessments, Costs, Government finance, Legal aspects, Nonstructural alternatives, Operating costs, Tariff, Industries, Industrial wastes, Industrial water, Pollution abatement, Water quality standards, Water quality, Water policy, Water pollution, Water pollution control.

This article examines the procedures to generate more efficient water quality control methods, emphasizing a tax incentives approach through use of subsidies. The two basic approaches to water quality control have evolved in the United States, the stream standards approach and the subsidies approach (tax incentives). The former involves limitation standards of allowable amounts of pollutants than can be discharged into the water system. This approach involves a scheme of classifications of the standards to be maintained and of the respective receiving waterbodies, depending on the various uses of the water. The latter approach involves governmental tax breaks, grants and loans for pollution abatement investments, seeking to encourage industry to install pollution abatement equipment. The author examines the cost displacement on the consumer that such industry investment will entail. Evaluation of both federal and state tax incentives is included. The author suggests that the attainment of desired stream standards can only be accomplished by an optimum low cost, basin-wide method of allocation, but that the solution to industrial pollution control will eventually be derived from the consumer, and not from government sponsored subsidies. (Welch-Florida)
W77-06552

POLYCHLORINATED BIPHENYLS.
For primary bibliographic entry see Field 5C.
W77-06554

OIL POLLUTION LIABILITY (HEARINGS ON HR 9294, 10969, 10363, 10756 WHICH PROVIDE A COMPREHENSIVE SYSTEM OF LIABILITY FOR OIL SPILL DAMAGE AND CLEANUP COSTS),
Hearings - Subcommittee on Coast Guard and Navigation--Comm. on Merchant Marine and Fisheries, U. S. House Rep., October 29, November 4, 12, 18, December 2, 4, 16, 1975, January 29, 1976. Serial No. 94-21, 367 p.

Descriptors: *Negligence, *Penalties(Legal), *Oil spills, *Compensation, Legislation, Oil pollution, Civil law, International law, Law enforcement, Regulation, Water law, Administration, Legal aspects, Federal Water Pollution Control Act, Water pollution sources, Water pollution, International commissions, Ships, Oil industry.
Identifiers: *Congressional hearings, *Compensatory fund, Liability, Maritime industry.

The proposed bills offer plans for comprehensive coverage for oil pollution damage, including a system of liability and compensation for oil spill damage and removal costs. The series of hearings considered possible solutions to the problems of damages inflicted on innocent parties by discharges of oil. This legislation proposes to establish a domestic oil pollution liability fund to provide protection for claimants not otherwise protected by two conventions previously adopted at a 1969 international conference. While the Federal Water Pollution Control Act is fairly comprehensive, it is restricted to cleanup costs, and does not cover liability for damages. At the present time, American citizens who sustain damages from oil pollution are dependent for compensation upon suits in civil courts based upon proof, in the case of vessels, of neglience or unseaworthiness. The proposed bills will provide for complete protection against damages to innocent third parties who will have ready access to compensatory funds. Furthermore, the ultimate burden for damage payments will rest on the parties responsible for the damage. At the hearings, testimony was received from various executive agencies, state and local officials, the maritime industry and the general public. (Rieck-Florida)
W77-06555

ORGANIC CHEMICAL CONTAMINANTS--CONTROL OPTIONS IN DRINKING WATER (PROPOSED).
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 136, p 28991-99, July 14, 1976.

Descriptors: *Potable water, *Public health, *Water quality, *Water pollution sources, Organic compounds, DDD, DDE, DDT, Diseases, Toxicity, Water pollution, Organic wastes, Chlorination, Regulation, Standards, Water quality control, Water law, Legal aspects, Federal government, Chemicals.
Identifiers: *Chloroform, *Administrative regulations.

The Safe Drinking Water Act envisions enactment of regulatory standards for organic chemicals in drinking water. The Environmental Protection Agency (EPA) is seeking any advice or technical data concerning organics in potable water to aid in its rule formulation. The problem is complex, as organics are to some extent present in all drinking water, derived from municipal and industrial point source discharges, from urban and rural nonpoint sources, and natural origins. Furthermore, most organic compounds in drinking water remain unidentified. Those that have been identified require detailed analysis as to harmful effects, and as to technology necessary for elimination, as well as to the costs. The current options open to the EPA are to establish: (1) maximum contaminant levels for specific organic chemicals such as chloroform; (2) maximum contaminant levels for general organics indicators; or (3) combinations of the above. Option 1 is severely limited by lack of knowledge of specific organics and, of those known, the EPA ban on DDT and similar pesticides has virtually eliminated harmful concentrations. Numerous other regulatory and non-regulatory options are presented for criticism. A summary of the advantages and disadvantages of each proposal in terms of costs, public health benefits, administrative difficulties, and technology is included. (Moorhouse-Florida)
W77-06557

TRAIN V COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. (NO AUTHORITY UNDER FEDERAL WATER POLLUTION CONTROL ACT TO REGULATE DISCHARGE OF THE SOURCE, BY PRODUCT AND SPECIAL NUCLEAR MATERIALS COVERED BY ATOMIC ENERGY ACT).
For primary bibliographic entry see Field 6E.
W77-06560

SIERRA CLUB V LESLIE SALT COMPANY (DEFINING NAVIGABLE WATERS JURISDICTIONALLY UNDER RIVERS AND HARBORS APPROPRIATION ACT OF 1899 AND THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972),
For primary bibliographic entry see Field 6E.
W77-06573

WATER POLLUTION; POWERS OF STATE WATER POLLUTION CONTROL BOARD.
For primary bibliographic entry see Field 6E.
W77-06580

PEOPLE AND THE SOUND. WATER MANAGEMENT.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06594

INLAND LAKE DEMONSTRATION PROJECT,
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
S. M. Born.
Prepared for the Upper Great Lakes Regional Commission, Washington, D.C., March 1974. 31 p, 19 fig, 5 tab, 34 ref.

Descriptors: Water resources, Water quality, *Water management(Applied), *Lakes, *Institutions, *Recreation, *Waste disposal, *Shorelines, *Land use, *Wisconsin, Environmental control, Wastes, Chemcontrol, Biocontrol, Aeration, Mixing.
Identifiers: *Inland Lake Demonstration Project, *Lake renewal, Lake deepening, Lake aeration, Mechanical mixing, Habitat manipulation.

The Inland Lake Demonstration Project was funded by the Upper Great Lakes Regional Commission, and carried out by the University of Wisconsin and the Wisconsin Department of Natural Resources. The goals of the project were to demonstrate techniques to restore, maintain and protect a high quality environment within and adjacent to lakes. Principal activities and concerns were: (1) lake renewal and management, (2) recreational land development, (3) lake management institutions, (4) on-site domestic waste disposal, (5) lake-related policy issues, and (6) public education about lake resources. Deteriorating water quality, degradation of lake shoreline scenery, and water use conflicts are the immediate problems. Lake renewal and management techniques included restricting nutrient influx, in-lake schemes to accelerate nutrient outflow or prevent recycling, lake aeration and/or mechanical mixing, lake deepening, chemical controls, biological controls and physical controls such as harvesting, water level fluctuation, and habitat manipula-

tion. Institutional aspects of on-site waste disposal focused on identifying legal incentives and opportunities for innovative systems such as the town sanitary district. Materials were prepared to facilitate citizen efforts to halt lake pollution. Also, in cooperation with realtors and developers, the pattern and quality of water-oriented land developments were improved. (Gentry-NC)
W77-06599

MANAGEMENT OF WATER AND RELATED LAND RESOURCES IN THE STATE OF MAINE,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06600

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE ALGEBRAIC TECHNOLOGICAL FUNCTION - A MECHANISM FOR INTEGRATING PHYSICAL AND ECONOMIC FACTORS IN GROUNDWATER MANAGEMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06339

6B. Evaluation Process

OPTIMIZING COSTS OF WASTE TREATMENT FACILITIES USING VALUE ANALYSIS,
Smith, Hinchman and Grylls Associates, Inc., Detroit, Mich.
For primary bibliographic entry see Field 5D.
W77-06156

PHYSICAL AND ECONOMIC PARAMETERS FOR PLANNING REGIONAL WASTE WATER TREATMENT SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-06171

COPING WITH WATER DEFICIENCY IN ARID AND SEMIARID COUNTRIES THROUGH HIGH-EFFICIENCY WATER MANAGEMENT,
Water Planning for Israel Ltd., Tel Aviv.
For primary bibliographic entry see Field 3B.
W77-06248

THE ALGEBRAIC TECHNOLOGICAL FUNCTION - A MECHANISM FOR INTEGRATING PHYSICAL AND ECONOMIC FACTORS IN GROUNDWATER MANAGEMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06339

PROPOSED WATER-SUPPLY INVESTIGATIONS IN SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W77-06340

WATER SUPPLY FOR THE ARRERO PILOT AREA OF THE NATIONAL RANGE DEVELOPMENT PROJECT, SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 6D.
W77-06341

ENVIRONMENTAL IMPACT ANALYSIS: A CASE STUDY OF THE ENVIRONMENTAL IMPACT OF THE CONSTRUCTION OF A DAM IN ZARIA PROVINCE,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6G.
W77-06352

ATTITUDES OF PROFESSIONALS IN WATER MANAGEMENT TOWARD THE USE OF WATER QUALITY INDICES,
American Bar Foundation, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W77-06353

A METHOD TO DETERMINE PERSONAL VALUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Business Administration.
D. L. Groves, and H. Kahalas.
Journal of Environmental Management, Vol. 4, p. 303-324, 1976. 1 tab., 1 fig., 41 ref.

Descriptors: *Recreation, *Methodology, *Social values, *Analytical techniques, Analysis, Decision making, Planning, Sampling, Measurement, Values, Social needs, Social participation, Recreation demand, Recreation facilities, Psychological aspects, *Pennsylvania.
Identifiers: *Personal values, Case study, State College(Pa).

A measurement methodology and system analysis to be used in the identification of personal values was developed to facilitate the inclusion of value information in a decision-making framework. To test the model, a case study was undertaken to determine the personal value to the user and to the general population of State College, Pennsylvania, of a public forested recreational area known as State Game Lands 176. An open-ended survey interview technique was used in the sample of 180 game land users and 170 individuals representing the general population with 60 of each group proportionately, randomly selected for use in the analysis. Macro and micro levels of measurements and analysis were implied from the derived methods. The macro level is used to make decisions about objectives and give evidence for justification of worth. Results indicated that Game Lands 176 had a positive core value to users and a positive peripheral value to the general population. The micro system, using Q analysis, sought information on how to understand and change values. Results showed, for example, that individuals in personal value group 2 of the general population were oriented toward particular components and the basic nature of these components was of a cognitive-action tendency nature. (Luedtke-Wisconsin)
W77-06354

1976 MINNESOTA WATER QUALITY INVENTORY: REPORT TO CONGRESS SECTION 305 (B).
Minnesota Pollution Control Agency, Minneapolis.
For primary bibliographic entry see Field 5A.
W77-06355

INLAND LAKE WATERSHED ANALYSIS,
Michigan Univ., Flint. Dept. of Physical Geography.
For primary bibliographic entry see Field 5G.
W77-06356

STATE OF IDAHO, INTERIM STATE WATER PLAN, PRELIMINARY REPORT.
Idaho Water Resource Board, Boise.
July 1972. 280 p. 54 fig., 51 tab.

Descriptors: *Idaho, *Comprehensive planning, *Water management(Applied), *State governments, Planning, Long-term planning, Water resources development, River basin development, Multiple-purpose projects, Social aspects, Legal aspects, Water transfer, Inter-basin transfer, Water policy, Water demand, Projections, Financing.
Identifiers: *Idaho State Water Plan, Demography.

A preliminary report showing Idaho's progress toward development of a state water plan includes information on all identified projects and programs included in the proposed plan, with a view to providing residents of the state with information about the planning alternatives that must be made in regard to the state's water supplies. The comprehensive overview includes information on state resources; the state water planning program; present water uses/problems/needs and future requirements; planning regions of the state, including descriptions of problems, needs and basic framework and development alternatives; concepts for interbasin water transfer; and conclusions and recommendations for 13 substantive planning elements. The preliminary report is made as input to the citizen participation process prior to public information meetings and public hearings, after which action is to be taken regarding the Interim State Water Plan. (Harris-Wisconsin)
W77-06358

TECHNICAL AND SUPPORT INFORMATION FOR THE STATE WATER PLAN-PART II. SNAKE RIVER BASINS.
Idaho Department of Water Resources, Boise.
March 1976. 279 p. 14 fig., 59 tab.

Descriptors: *Simulation analysis, *Idaho, *Comprehensive planning, *Water management(Applied), *State governments, Water demand, Water resources, Planning, Water resources development, River basin development, Multiple-purpose projects, Social aspects, Legal aspects, Projections.
Identifiers: *Idaho State Water Plan, *Snake River Basins(Idaho), Demography.

A comprehensive report compiles the study methodology, summarizes the available resources and projects the needs and impacts on various water uses for the Snake Basin, the largest of three Idaho water planning basin areas. The report presents conditions with and without a plan as foreseen through the studies. These projections in turn are based on numerous computer model simulations in which the technical effects of several alternative water uses were evaluated. Included in the report are separate chapters dealing with: (1) methodology, including a description of the state's public participation program and water supply models; (2) a resource summary; (3) projections for demographic characteristics and various industries; (4) listings of simulated conditions assuming no plan is adopted; (5) a similar listing was simulated for after the adoption of a plan; (6) summaries of the general plan for each of 15 sub-basin tributaries. The report information is intended to supplement an ongoing public information program in support of the state water plan, as well as to provide technical information to water resource planners. (Harris-Wisconsin)
W77-06359

SUMMARY REPORT CONCLUSIONS AND RECOMMENDATIONS: PANHANDLE RIVER BASINS, STATE WATER PLAN--PART TWO.
Idaho Dept. of Water Resources, Boise.
July 1976. 103 p, 10 fig, 8 tab.

Descriptors: *Idaho, *Comprehensive planning, *Water management(Applied), *State governments, Planning, Long-term planning, Water resources development, River basin development, Multiple-purpose projects, Social aspects, Legal aspects, Alternative planning.

Identifiers: *Panhandle River Basins(Idaho), *Idaho State Water Plan.

Thirty substantive operational recommendations for changes to the Idaho State Water Plan are embodied in a draft overview of the plan elements as they apply to the Panhandle region in the northern tip of the state--one of three Idaho river basin study areas. Included are one recommendation for the allocation of available water, 24 legal and policy changes, three program changes, one recommendation concerning funding and one related to planning studies. In addition, plan conclusions are delineated for 18 elements: forestry, fish and wildlife, navigation, electric power, flood damage reduction, water quality and pollution control, environmental quality, lakes and reservoir management, recreation, Indian resource use municipal and industrial water, land uses, mining, agriculture, urban lands, interstate considerations, international considerations, and studies, and research. Effects of alternative plans are considered for subregions in the basin. (Harris-Wisconsin)
W77-06360

THE CALIFORNIA STATE WATER PROJECT IN 1975, APPENDIX D. COSTS OF RECREATION AND FISH AND WILDLIFE ENHANCEMENT.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 6C.
W77-06361

THE CALIFORNIA STATE WATER PROJECT SUMMARY: 1974.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 8A.
W77-06362

REPORT ON RESULTS OF RAINY RIVER FISH TAINTING QUESTIONNAIRE.
Minnesota Pollution Control Agency, Roseville. Water Quality Div.
For primary bibliographic entry see Field 5G.
W77-06367

INVOLVING THE PUBLIC IN LIMNOLOGY--AN APPROACH TO COMMUNICATION,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 5G.
W77-06392

INTEREST GROUP PERCEPTIONS OF DEVELOPMENT ISSUES IN TIDEWATER VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geography.
For primary bibliographic entry see Field 6G.
W77-06400

LEGAL CRITERIA NEEDED TO PROVIDE EFFECTIVE INSTRUMENTS FOR INVENTORY, DEVELOPMENT, CONSERVATION AND USE OF WATER RESOURCES AT THE LOCAL LEVEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Commission.
For primary bibliographic entry see Field 6E.
W77-06533

HISTORICAL AND GEOGRAPHICAL EVOLUTION OF WATER LAW AND ITS ROLE IN THE MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
For primary bibliographic entry see Field 6E.
W77-06536

SUPPLEMENT TO FINAL ENVIRONMENTAL STATEMENT; HARRY S. TRUMAN DAM AND RESERVOIR.
Army Engineer District, Kansas City, Mo.
September, 1973, 217 p, 10 append.

Descriptors: *Environmental effects, *Dams, *Multiple-purpose projects, *Project feasibility, Economic feasibility, *Missouri, Reservoirs, Federal government, Administrative agencies, Flood control, Flood protection, Financial feasibility, Economics, Hydroelectric power, Social impact, Economic justification, Fish, Mussels, Archaeology, Non-structural alternatives, Legal aspects.
Identifiers: *Environmental impact statement(EIS), *Harry S. Truman Dam Reservoir(Mo).

The primary purpose for supplementing the Final Environmental Impact Statement (EIS) is to respond to issues raised in a report from the Government Accounting Office (GAO) and in litigation by the Environmental Defense Fund. The GAO report questioned weaknesses in the estimating practices of the Corps of Engineers, such as understated interest during construction and understated operation and maintenance costs. The report also questioned the financial feasibility of including hydroelectric power facilities in the project. The issues raised in litigation include: the method used for benefit-cost derivation; the economics of hydroelectric power; exploration of project alternatives; and, the social and economic impacts of the project. Other items included in the supplement are the response to comments on the Final EIS made by the Missouri Department of Conservation, an updated benefit-cost analysis summary for the project, additional information on project alternatives, and updated information on paddlefish, naiades, and the Rodger's Shelter Archeological Site. (See also W77-06539) (Capehart-Florida)
W77-06538

APPENDIX A - AS ORDERED BY THE COURT TO THE SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT HARRY S. TRUMAN DAM AND RESERVOIR OSAGE RIVER, MISSOURI.
Army Engineer District, Kansas City, Mo.
November 1973, 399 p.

Descriptors: *Dam construction, *Environmental effects, *Project feasibility, *Cost-benefit analysis, Judicial decisions, Administrative agencies, Administrative decisions, Hydroelectric power, Social impact, Economic impact, Rivers, Reservoirs, Archaeology, Flooding, Legal aspects, Fish, Federal government, *Missouri, Dams.
Identifiers: *Environmental impact statement(EIS), National Environmental Policy Act, *Harry S. Truman Dam Reservoir(Mo).

In compilance with an order of the United States District Court for the Western District of Missouri, the Corps of Engineers has prepared an appendix to the supplement to the Final Environmental Impact Statement (EIS). The first section of the appendix contains the opinion of the district court in which the court held that the Final EIS was adequate, that it met the requirements of the National Environmental Policy Act, and that the decision of the Corps of Engineer to proceed with the Harry S. Truman Dam and Reservoir Project was neither arbitrary nor capricious. The second section includes the exhibits of plaintiff-environmental organization which were received in evidence by the court, except for those exhibits which are included in either the Final EIS or its supplement. The exhibits include expert testimony on such issues as the benefit-cost derivation method, the economics of hydroelectric power, alternatives to the project, and the social, economic and environmental impacts of the project. The final section contains the statement of findings prepared by the Corps of Engineers. (See also W77-06538) (Capehart-Florida)
W77-06539

THE WASHINGTON SHORELINE MANAGEMENT ACT OF 1971,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W77-06547

PEOPLE AND THE SOUND. WATER MANAGEMENT.
Environmental Protection Agency, Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 236, Price codes: A08 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, Boston, Mass., March 1975. 159 p, 13 fig, 34 tab, 65 ref, 4 append.

Descriptors: *Water supply, *Water quality, *Water management, *Land management, *Water treatment, *Water pollution, *Environmental control, *New York, *Connecticut, Legislation, Comprehensive planning, Reservoirs, Watersheds, Aquifers, Sewers.
Identifiers: *Economic aspects, *Long Island Sound, Connecticut Clean Water Act of 1967, New York Environment Conservation Law (1949), Federal Water Pollution Control Act Amendments of 1972.

Existing water supply and water quality problems, and current programs of the Long Island Sound (LIS) area, are examined. From this information environmental and economic alternative plans are presented from which a composite, recommended plan is derived. The Connecticut region relies generally on surface water sources for its water supply drawing nearly 212 million gallons per day (MGD) from a capacity of 278 MGD for the 85% of the population obtaining water from public water supply systems. Reservoirs and watershed lands related to the water system are increasingly being asked to serve multiple purposes. The New York region of the LIS relies on the New York City Water System and on ground water. With the increased construction of sewers, ground water aquifers have not been adequately replenished. Major sources of pollution of LIS are: municipal and industrial wastes, overflows from combined sewers, non-point sources, wastes from pleasure crafts, oil spilled from ships and storage areas, heated water inputs, and inflows from polluted rivers. Comprehensive prevention measures serving as bases for current programs were outlined in the Connecticut Clean Water Act of 1967, Article 17 of the New York Environmental Conservation Law (1949), and the 1972 Federal Water Pollution Control Act Amendments. The composite plan recommends: 'best practical treatment' for municipalities and 'best available treatment' for industries; cost-effective programs to abate combined sewer pollution; land management to reduce non-point pollution; no discharge area; mitigate environmental effects of dredging and disposing in the LIS area. (Gentry-NC)
W77-06594

PEOPLE AND THE SOUND. OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 238, Price codes: A127 in paper copy, A07 in microfiche. Prepared for the New England River Basins Commission, Boston, Mass., January 1975. 112 p, 3 fig, 20 tab, 6 append.

Descriptors: *Recreation, *Water resources, *Parks, *Beaches, *Water sports, *Camping, *Land development, *New York, *Connecticut, Public utilities, Swimming, Boating, Public access, Public land, Flood plains, Legislation.
Identifiers: *Land acquisition, *Open space, *Long Island Sound, Picnicking, Hiking trails.

Information is presented on projected demand and supply of water-related and open space recreation activities in the Long Island Sound (LIS) area. Increased demand is anticipated for beach swimming, boating, picnicking, camping and hiking trails. Currently, access limits available beach area. Private facilities for storing and handling boats are already congested and camping facilities along trails and with automobile access are in short supply. Emphasis is placed on meeting urban needs for recreation. Alternatives considered are: acquisition and development, redevelopment of flood plain, use of public utility property, increased access, efficient use of existing parks, incentives to private sector, and not meeting future needs. The recommended plan, a composite of environmental, economic and social alternatives, addressed state and local actions. Among other things, the state should: (1) acquire and develop 11,000 acres by the year 2020; (2) develop 3.3 miles of flood plain shoreline; (3) develop a fund to acquire shorefront property after natural disasters; (4) pass legislation to give right of first refusal to public recreation authorities when recreation property if for sale; (5) establish property tax allowance for private recreation facilities. Local authorities should purchase 1800 acres by 2020, develop a fund similar to '3' above, open parks and beaches on weekdays. Other actions recommended are the multiple use of watershed and public utility lands, development of ferry routes, altering the work week, and coordinating public transit schedules. (Gentry-NC)
W77-06595

PEOPLE AND THE SOUND. EROSION AND SEDIMENTATION,
Army Engineer District, Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 245, Price codes: A96 in paper copy, A05 in microfiche. Prepared for the New England River Basins Commission, Boston, Mass., January 1975. 82 p, 6 fig, 10 tab, 13 ref, 4 append.

Descriptors: *Erosion, *Bank erosion, *Beach erosion, *Erosion control, *Erosion rates, *Sedimentation, *Harbors, *Sedimentation rates, *Non-structural alternatives, *Land use, *Environmental control, *New York, *Connecticut, Landslides, Roadbanks, Environmental effects.
Identifiers: *Long Island Sound, *Long Island(NY), *Economic aspects, Structural controls.

Two separate planning schemes focused on Long Island Sound (LIS) are presented to analyze damages and alternative measures to control erosion and sedimentation in coastal and upland regions. Annual coastal erosion damage (75% of which is on Long Island) is about $7 million now, and is projected to be $20 million in the year 2020. Seventy-five percent of erosion damage is accounted for in the value of land being washed away along coastlines. Annual coastal sedimentation damages are presently $2.3 million, occurring mostly in Connecticut for harbor maintenance. Seven methods of minimmizing damages were considered: (1) regulate coastal land use, (2) maintain existing beach erosion control structures, (3) construct new structures, (4) renourish beaches with sand, (5) build new beaches, (6) dredge channels, (7) accept the remaining damages. Components of the recommended plan, with share of costs in parentheses, are: dredge channels (25%), maintain existing structures (10%), regulate land use (2%), and accept remaining damage (63%). Upland erorion damages are presently $9 million, occurring in deterioration of urban land values, agricultural production, natural beauty, and water quality; in the year 2020 projected damages will be $12 million. The recommeded plan is: control urban losses nonstructurally (34%), control agricultural losses nonstructurally (14%), control agricultural losses structurally (5%), control roadbank erosion (5%), and accept remaining damage (42%). (Gentry-NC)
W77-06596

PEOPLE AND THE SOUND. MINERAL RESOURCES AND MINING,
Bureau of Mines, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 243, Price codes: A69 in paper copy, A04 in microfiche. Prepared for the New England River Basins Commission, Boston, Mass., May 1975. 57 p, 16 fig, 6 tab, 19 ref, 8 append.

Descriptors: *Gravels, *Sand, *Mining, *Supply, *Demand, *Land development, *Land use, *New York, *Connecticut, Mineral industry, Transportation.
Identifiers: *Stone, *Long Island Sound, Economic aspects.

The current and projected supply of and demand for sand, gravel and stone in the Long Island Sound area are analyzed. These minerals account for 3.5%, 7.0%, and 13.0% of costs for residential, commercial and highway construction, respectively. Projected growth rates for 1990 demand for sand and gravel are 56.25%, and 75.43% for stone. No stone occurs on Long Island and gravel is in shorter supply generally than sand everywhere. Other than these limitations, naturally existing minerals are abundant. Man-made limitations are imposed by the development of land before mineral resources are extracted, transportation costs, and direct controls prohibiting mining or making it uneconomical. Rehabilitation of abandoned sites is feasible. Marine mining is presently economical but is restricted by environmental concerns. At present consuption rates, mineral reserves on Long Island will be depleted by 1985-1990, while Connecticut reserves are ample for many years if mineral deposit sites are not preempted by other land uses. the recommended plan, drawn from environmental, economic and social measures, proposed sequential land use with environmental safeguards, submarine mining, and some importation from outside the region. (Gentry-NC)
W77-06597

PEOPLE AND THE SOUND. FLOOD DAMAGE REDUCTION.
Army Engineer District, Boston, Mass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 244, Price codes: A06 in paper copy, A01 in microfiche. Prepared for the New England River Basins Commission, Boston, Mass., January 1975. 98 p, 5 fig, 11 tab, 19 ref, 8 append.

Descriptors: *Floods, *Flooding, *Flood plains, *Nonstructural alternatives, *Flood proofing, *Weather modification, *Dams, *Hurricanes, *Flood control, *Flood damage, *Flood plain insurance, *Land use, *Zoning, *New York, *Connecticut, Flood forecasting, Warning systems, Weather forecasting, Legislation.
Identifiers: *Tidal floods, *Long Island Sound, *Structural measures, U.S. Soil Conservation Service, PL 566 Small Watershed Act, Water Resources Development Act of 1974.

Tidal floods are produced by hurricanes and extratropical storms. In the Long Island Sound area 93% of the regional tidal flood damages occurred in Connecticut. Average annual tidal flood damages are estimated at $11 million in 1970, $17 million in 1990, and $32 million in 2020, with total damages reaching $1 billion in the next 50 years. Six structural measures to control riverine flood damages have been recommended by the U.S. Soil Conservation Service (SCS). The SCS estimated that structural measures are ineffective without non-structural flood plain management measures such as flood insurance and zoning. Technical assistance and cost sharing have been made available under the Federal Small Watershed Act. Six classes of alternative measures to reduce flooding are: modify hurricanes, structural measures, floodproofing, control flood plain development through land use measures, accept remaining damages, and mitigate suffering through insurance and emergency assistance. Elements of the recommended plan, with the proportion of damages reduced given in parentheses, are: flood control structures (36%), modify hurricanes (16%), regulate land and excavate (3%), public education (2%), accept remaining damage (19%). (Gentry-NC)
W77-06598

MANAGEMENT OF WATER AND RELATED LAND RESOURCES IN THE STATE OF MAINE,
New England River Basins Commission, Boston, Mass.
B. R. Anderson, and C. F. M. Watson.
Available from the National Technical Information Service as PB-250 671, Price codes: A10 in paper copy, A01 in microfiche. Prepared for the Maine State Planning Office, March 1975. 202 p, 29 tab, 26 maps, 6 charts.

Descriptors: *Maine, *Legal aspects, *Riparian rights, *Data, *Water supply, *Water quality, *Flood control, *Land use, *Recreation, *Institutions, Nonstructural alternatives, Electric power plants, Wildlife conservation, Fish and wildlife, Government, Hydrology, Groundwater, Climate, Geology, Soils.
Identifiers: *Flood plain management, Structural measures, Public participation, Siting procedures, Water Resources Planning Act, Federal Safe Drinking Water Act, New England River Basins Commission.

By reviewing the data needs and general problems, this report cites a need for an integrated water and land resource planning and management program consistent with Federal policy objectives. Some of the problems facing policy-makers concerned with water and land resources are: (1) water law in Maine is based on riparian rights, thereby limiting the number of beneficiaries of water pollution control and water management; (2) the absence of a clearly defined Federal or State funding program to achieve and maintain safe drinking water standards places a heavy burden on water companies and the consumer; (3) a schedule of priorities in allocating Federal water treatment facility construction funds does not exist; (4) there is minimal public awareness of flood risk, and public resistance to structural and non-structural flood damage reduction measures is therefore stronger than necessary; (5) an inventory of State land activity and land cover has not been taken, consequently there are no statewide policy guidelines for land use planning and management; (6) there is a need for improved siting procedures for location and construction of power plants, and a need to preserve outdoor recreation sites from other conflicting uses. Recommendations are to create a policy-making body to coordinate the programs presently scattered among at least ten State agencies. This organization is to oversee and create linkages between State natural resource programs as well as between local, State, regional and Federal programs. It is also to be a focus for citizen participation, thus serving an advocacy role in setting budgetary priorities. (Gentry-NC)
W77-06600

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OPTIMIZING COSTS OF WASTE TREATMENT FACILITIES USING VALUE ANALYSIS,
Smith, Hinchman and Grylls Associates, Inc., Detroit, Mich.
For primary bibliographic entry see Field 5D.
W77-06156

ENERGY REQUIREMENTS FOR WASTE-WATER TREATMENT. PART 2,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5D.
W77-06252

ENVIRONMENTAL IMPACT ANALYSIS: A CASE STUDY OF THE ENVIRONMENTAL IMPACT OF THE CONSTRUCTION OF A DAM IN ZARIA PROVINCE,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6G.
W77-06352

THE CALIFORNIA STATE WATER PROJECT IN 1975, APPENDIX D. COSTS OF RECREATION AND FISH AND WILDLIFE ENHANCEME..T.
California State Dept. of Water Resources, Sacramento.
Bulletin No 132-75. 18 p, 6 tab.

Descriptors: *California, *Costs, *Water management(Applied), *Recreation, *Fish conservation, *Wildlife conservation, Financing, Water resources development, Multiple-purpose projects, Land appraisals, Interest, Bond issues.
Identifiers: *California State Water Project.

Costs of the California State Water Project facilities which the Department of Water Resources has allocated to recreation and enhancement of wildlife are described, for a one-year period together with expenditures for acquiring rights-of-way, easements, and property for recreation development associated with such facilities. Costs are individually given for: (1) joint capital costs allocated to recreation and enhancement; and (2) specific costs of acquiring land for recreation and development. Calculations are given for interest accruals on California water resources development bond fund disbursements, and allocation percentages are summarized for capital costs of individual project conservation facilities and for project transportation facilities. (Harris-Wisconsin)
W77-06361

LEGAL CRITERIA NEEDED TO PROVIDE EFFECTIVE INSTRUMENTS FOR INVENTORY, DEVELOPMENT, CONSERVATION AND USE OF WATER RESOURCES AT THE LOCAL LEVEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Commission.
For primary bibliographic entry see Field 6E.
W77-06533

6D. Water Demand

COPING WITH WATER DEFICIENCY IN ARID AND SEMIARID COUNTRIES THROUGH HIGH-EFFICIENCY WATER MANAGEMENT,
Water Planning for Israel Ltd., Tel Aviv.
For primary bibliographic entry see Field 3B.
W77-06248

THE ALGEBRAIC TECHNOLOGICAL FUNCTION - A MECHANISM FOR INTEGRATING PHYSICAL AND ECONOMIC FACTORS IN GROUNDWATER MANAGEMENT,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-06339

PROPOSED WATER-SUPPLY INVESTIGATIONS IN SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
D. A. Phoenix.
Open-file report, February 1974. 75 p, 20 fig, 1 tab, append.

Descriptors: *Water supply, *Water resources development, *Surface waters, *Groundwater, *Livestock, *Africa, Water management(Applied), Ponds, Reservoirs, Perennial streams, Aquifers, Water wells, Project planning, Surveys, Hydrogeology, Water demand, Available water, Evaluation.
Identifiers: *Ethiopia(Sidamo Province), *Dawa Parma River(Ethiopa).

For centuries, the rich grazing lands of Southern Sidamo Province, Ethiopia have been explored for water by nomadic herdsmen. Specialists in range management and veterinary controls working with geologists and hydrologists in their search for permanent water supplies must attempt to improve herds of livestock so that businessmen can systematically market the product. This report describes the results of an air and ground hydrologic reconnaissance of some 32,000 square kilometers. Existing (1966) water resources developments, chiefly for livestock and village supplies, include surface reservoirs, a few drilled wells, several clusters of dug wells in the Mega area, several scattered springs, and the perennial Dawa Parma River. Surface-water reservoirs range from hand-dug ponds of a few hundred cubic meters of water. All the existing drilled wells tap saturated alluvium at depths of less than 120 meters. The dug wells tap water-bearing zones in tuffaceous lacustrine deposits or stream-channel alluvium generally at depths of less than 30 meters. The springs mostly rise from fractured Precambrian quartzite and individual discharges are all less than 75 liters per minute. Terms of reference are outlined for a longer term water-resources investigation of the region including staffing, housing and equipment requirements and other logistic support. (Woodard-USGS)
W77-06340

WATER SUPPLY FOR THE ARRERO PILOT AREA OF THE NATIONAL RANGE DEVELOPMENT PROJECT, SIDAMO PROVINCE, ETHIOPIA,
Geological Survey, Reston, Va.
J. R. Jones.
Open-file report, December 1974. 30 p, 1 fig, 4 tab, 1 ref.

Descriptors: *Water supply, *Water resources development, *Ponds, *Groundwater, *Livestock, *Africa, Water management(Applied), Project planning, Surveys, Hydrography, Hydrogeology, Water demand, Available water, Evaluation.
Identifiers: *Ethiopia(Sidamo Province), *Arrero area(Ethiopia).

A pilot range-management project of 800 aquare miles in the Arrero area of southern Ethiopia is described. Means of supplying 360 cubic meters of water per day for livestock and people are suggested. A budget is presented for development and production of ponds and ground water as part of the required water suuply and outlines further studies needed. (Woodard-USGS)
W77-06341

STATE OF IDAHO, INTERIM STATE WATER PLAN, PRELIMINARY REPORT.
Idaho Water Resource Board, Boise.
For primary bibliographic entry see Field 6B.
W77-06358

TECHNICAL AND SUPPORT INFORMATION FOR THE STATE WATER PLAN-PART II. SNAKE RIVER BASINS.
Idaho Department of Water Resources, Boise.
For primary bibliographic entry see Field 6B.
W77-06359

SUMMARY REPORT CONCLUSIONS AND RECOMMENDATIONS: PANHANDLE RIVER BASINS, STATE WATER PLAN--PART TWO.
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 6B.
W77-06360

WATER RESOURCES AVAILABILITY, QUALITY, AND COST IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
R. J. Schicht, J. R. Adams, and J. B. Stall.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 763, Price Codes: A05 in paper copy, A01 in microfiche. Report of Investigation 83, 1976. 90 p, 62 fig, 65 tab, 77 ref.

Descriptors: *Water resources, *Illinois, *Alternative planning, *Alternative costs, *Water resources development, *Lake Michigan, Surface waters, Groundwater, Water quality, Computer models, Conjunctive use, Data collections, Water treatment, Water transfer, *Water demand, Groundwater recharge, Water supply, Water utilization, Aquifers, Surface water availability, Groundwater mining, Reservoirs, Reservoir sites, Reservoir yield.
Identifiers: Cook County(Ill), Du Page County(Ill), Kane County(Ill), McHenry County(Ill), Lake County(Ill), Will County(Ill).

The report summarized extensive studies of the water resources of northeastern Illinois. The 3700-square-mile metropolitan-industrial study area, with a population of seven million persons, included Cook, Du Page, Kane, McHenry, Lake, and Will Counties. Water resources for the area consist of Lake Michigan water, surface water, and groundwater resources. Because the use of Lake Michigan water is limited by the U.S. Supreme Court and the once favorable groundwater resources in the deep sandstone are being overdeveloped, future water shortages are expected. Available groundwater and surface water resources in addition to Lake Michigan were estimated by township and compared with projected future water demands for 1980-2010 to determine the amount and location of deficits. Alternative sources to meet the specific shortages were studied and compared, where possible by cost. Alternatives studied included purchase of lake water from the city of Chivago, use of water from the Kankakee and Fox Rivers, transfer of groundwater from surplus areas, construction of reservoirs, desalting brackish groundwater, artificial recharge of aquifers, precipitation augmentation, and shifts in water use in connection with the Chicago Tunnel and Reservoir Plan. Extensive water quality data also were summarized for the water resources of the area. Water shortages, depending on resource use schemes, may approach 200 million gallons per day by the year 2000. Possibilities for meeting these needs were described as a guide to allocation of Lake Michigan water and future planning for water resources. (Humphreys-ISWS)
W77-06531

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6E.
W77-06534

PEOPLE AND THE SOUND. OUTDOOR RECREATION,
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-06595

PEOPLE AND THE SOUND. MINERAL RESOURCES AND MINING,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-06597

INLAND LAKE DEMONSTRATION PROJECT,
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5G.
W77-06599

6E. Water Law and Institutions

THE OPERATION OF THE DUMPING AT SEA ACT 1974,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5G.
W77-06176

CONSEQUENCES TO INDUSTRY OF THE RECENT WATER LEGISLATION: THE ROLE OF THE REGIONAL WATER AUTHORITY,
Yorkshire Water Authority (England).
For primary bibliographic entry see Field 5G.
W77-06177

HOW MUCH POLLUTION CONTROL FOR WHAT PRICE,
Energy Research and Development Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-06179

CONTROL AND TREATMENT OF WASTE WATER,
For primary bibliographic entry see Field 5G.
W77-06185

CLASSIFICATION OF SURFACE WATERS.
Maine Dept. of Environmental Protection, Augusta.
For primary bibliographic entry see Field 5G.
W77-06373

HISTORY OF THE PHOSPHATE DETERGENT BAN IN INDIANA,
Manchester Coll., North Manchester, Ind.
For primary bibliographic entry see Field 5G.
W77-06378

WATER POLLUTION FROM INDUSTRIAL SOURCES IN SWEDEN AND RECENT TRENDS TO PREVENT IT,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5G.
W77-06383

THE IMPACT OF PUBLIC LAW 92-500 ON MUNICIPAL POLLUTION CONTROL TECHNOLOGY,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W77-06532

LEGAL CRITERIA NEEDED TO PROVIDE EFFECTIVE INSTRUMENTS FOR INVENTORY, DEVELOPMENT, CONSERVATION AND USE OF WATER RESOURCES AT THE LOCAL LEVEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Commission.
O. Tamir.
In: Proceedings of the International Conference on Water Law and Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (COPLANARH), Caracas, Venezuela, p 766-789, 1976.

Descriptors: *Water rights, *Water allocation(Policy), *Competing uses, *Economics, *Governments, Water law, Administration, Governmental interrelations, Local governments, Constraints, Eminent domain, Permits, Pollution taxes(Charges), Rationing(Water), Legal aspects, Riparian rights, Administrative decisions, Coordination, Cost sharing, Political aspects, Water demand, Water management(Applied).
Identifiers: *Licenses, *Public trust doctrine, Administrative regulations, Comparative law, *Israel.

Water resources, a vital commodity in every country, demand a comprehensive and intensive legal and administrative system to facilitate complete control over water in all its aspects. One of the foundation principles of such a system of control is national ownership of water - expropriating all private water ownership and centralizing water management in one body. Riparian rights would not exist in such a system. Rights to use of water would be distributed according to the purpose for which they are sought, would cease when the purpose ceases to exist, would be appurtenant to land, and not personal, and would always be subject to cancellation in the public interest. Priority of uses would depend on national economic needs and goals. A licensing scheme is essential to such a system with issuance dependent on maximum efficiency allocation. In order to insure economical use of water, a progressive charge for water used should be imposed. Extensive programs for the prevention of water pollution should also be included. User associations, municipal associations, and regional water authorities would facilitate cooperation. The regional authority would be given considerable management responsibilities. Following the presentation of this comprehensive water administration program, the legal and administrative system of Israel is examined and compared to the ideal framework. (Moorhouse-Florida)
W77-06533

THE ROLE OF NEW TECHNOLOGIES FOR IMPROVED WATER MANAGEMENT AND RELATED EFFECTS ON WATER LAW SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein.
In: Proceedings of the International Conference on Global Water Law Systems, International Association for Water Law, September 1-9, 1975, Valencia, Spain; Published by Colorado State University, Ft. Collins, Colorado 80523, p 1107-48, 1976. 66 ref.

Descriptors: *Water resources development, *Technology, *Systems analysis, *Water allocation(Policy), Water management(Applied), Water quality, Flood control, Irrigation, Planning, Electric power production, Agriculture, Water supply development, Desalination, Groundwater, Saline water intrusion, Surface runoff, Thermal pollution, Storm runoff, Water treatment, Legal aspects, International law.

The continuing increase in the demand for water throughout the world requires the development of new technologies to solve the problems associated with this demand. Solutions are needed for problems of flood control, irrigation, effects of urban growth, and water pollution. Additional demand for water is likely to occur in association with energy production. Two methods of augmenting fresh water supplies are desalination and waste water treatment. The author discusses the relationship between the development of water resources and the legal system. The legal constraints on new technologies are a significant part of the decision-making process in the design and management of water resource systems. The author suggests that any systems design methodology applied to water resource development should include the legal system as an integral component of the entire system. He recommends that proposed laws be tested through systems analysis to determine their possible effect before they are implemented rather than afterwards. (Capehart-Florida)
W77-06534

HISTORICAL AND GEOGRAPHICAL EVOLUTION OF WATER LAW AND ITS ROLE IN THE MANAGEMENT AND DEVELOPMENT OF WATER RESOURCES,
G. J. Cano.
Proceedings of the International Conference on Global Water Law Systems, International Association for Water Law, September 1-9, 1975, Valencia Spain; published by Colorado State University, Ft. Collins, Colo. 80523, p 115-135, 1976. 1 fig, 53 ref.

Descriptors: *International law, *History, *Planning, *Water resources, Water law, Navigable waters, Estuaries, Coasts, Beds, Legislation, Governments, Environmental law, Water pollution, Legal aspects, Riparian rights, Water, Water utilization, Water conservation, Water demand, Water management(Applied), Water rights, Technology.

Water law, as applied to non-ocean waters, has developed in difference forms in the nations of the world. Often nations with geographic similarities have independently developed similar water laws. There are three stages in the evolution of water law. Initially, when water availability exceeds its demand, the law favors the use of water. Then, when water demand begins to exceed the availability, the law operates to restrict consumption. Finally, when water consumption increases due to technological progress, the law must develop solutions such as water recycling. Water law is influenced by a number of factors including changes in the social or political structure of a nation, development of water technologies, and increased environmental awareness. If a balance is struck between these factors, a well planned, properly financed and adequately enforced water law can lead to optimum utilization of water. Since water problems tend to be local in nature, a world-wide water system would be most effective if administered on a local rather than national or global basis. (Capehart-Florida)
W77-06536

INTERNATIONAL COOPERATION FOR THE PREVENTION OF MARINE OIL POLLUTION,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-06537

THE COLORADO RIVER SALINITY PROBLEM--OLD APPROACHES TO A NEW ISSUE,
For primary bibliographic entry see Field 5G.
W77-06540

FLOOD CONTROL IN OKLAHOMA: AN EXAMPLE OF LAND USE PRECEDING LAND USE PLANNING,
Tulsa Univ., Okla. Coll. of Law.
For primary bibliographic entry see Field 4A.
W77-06542

ENFORCEMENT OF OIL POLLUTION LEGISLATION,
For primary bibliographic entry see Field 5G.
W77-06543

SHORELINE MANAGEMENT AND BOATING - CAN THE INDUSTRY SURVIVE. (REPORT ON THE FOURTH MARINE RECREATION CONFERENCE).
New England Marine Advisory Service, Durham, New Hampshire (1976). 29 p.

Descriptors: *Boating, *Coasts, *Planning, *Recreation, Shores, Political aspects, Boating regulations, Economic impact, Governments, Tourism, Erosion, Dredging, Pollution, Coast guard regulations, Marinas, Boats, Harbors, Oil, Continental shelf, Offshore platforms, Environmental effects.
Identifiers: *Coastal zone management, Licenses, Public hearings.

The 1975 Marine Recreation Conference examined the conflicts between coastal zone mangement an the boating and marine industries. Problems of coastal zone management having possible effect on the marine industries include shoreline erosion caused by boat wakes, dredging and filling of shorelines, and dumping of wastes and pollutants from boats. The effect of Outer Continental Shelf oil developmet on boating was considered. Two areas discussed were the impact on water quality and the development of shoreline areas to support the offshore operations. The role of the Coast Guard in coastal zone mangement was also examined. A series of work groups were formed to study specific issues affecting the coastal zone and the inland waterways. The topics covered include: ownership of the water; the survival of free enterprise on the waterfront; research needs in boating; planning for better boting; and pressures for alternative uses of water front property. (Capehart-Florida)
W77-06544

TRIBUTARY GROUND WATER AND CHANGE-OF-PLACE-OF-USE RULES IN DESIGNATED GROUND WATER BASINS IN COLORADO.
For primary bibliographic entry see Field 4B.
W77-06545

POLLUTION--NO PRIVATE COMPENSATION FOR INVASION OF PUBLIC RIGHTS ABSENT PARTICULAR DAMAGES, BURGESS V THE TAMANO, 1973 A.M.C. 1939 (D ME 1973),
For primary bibliographic entry see Field 5G.
W77-06546

THE WASHINGTON SHORELINE MANAGEMENT ACT OF 1971,
Washington Univ., Seattle. School of Law.
G. Crooks.
Washington Law Review, Vol. 49, p. 423-62 (1974).

Descriptors: *Washington, *Permits, *Ownership of beds, *Management, Shorelines, Legislation, Regulation, Riparian rights, Public rights, Navigable waters, Water law, Legal aspects, Wetlands, Constitutional law, Administration, Planning, Comprehensive planning.
Identifiers: *Property law, *Shorelands, *Tidelands, Riparian uses, Coastal resources.

In 1969 the Supreme Court of the State of Washington held that ownership of lands beneath navigable waters may not necessarily carry the right of the owner to restrict use of the waters to the public. The resulting ulncertainty as the owner to restrict use of the waters to the public. The resulting uncertainty as to the reamifications of this decision was largely responsible for the enactment of the Washington Shoreline Managenment Act. This act requires all local governments to inventory the land and water areas within their jurisdiction which are subject to the Act (as defined therein) and to prepare a master progrm for permissible uses of these areas. When these programs take effect, they will constitute use regulations for the various shorelines of the state and will be the basis for decisions on permit applications for use of the land and water adjacent to the shorelines. Guidelines are established for the planning and permit processes, including requirements for citizen participation, public hearings, and review by state authority. A potential problem exists with regard to whether the permit requirements will result in an uncompensated and therefore unconstitutional taking of private property. The basic policy of the Act, however, is not to prescribe or proscribe uses of property, but to plan and regulate. (Sloan-Florida)
W77-06547

PROTECTION OF UNDERGROUND DRINKING WATER SUPPLIES - THE GONZALEZ AMENDMENT TO THE SAFE DRINKING WATER ACT,
Openheimer, Rosenberg, Kelleher, and Wheatley, Inc., San Antonio, Tex.
For primary bibliographic entry see Field 5G.
W77-06548

THE COMPULSORY SELF-DISCLOSURE AND PENALTY PROVISIONS OF THE 1972 AMENDMENTS TO THE FEDERAL WATER POLLUTION CONTROL ACT: CATCH-22 AT SEA,
For primary bibliographic entry see Field 5G.
W77-06549

BETWEEN SCYLLA AND CHARYBDIS: PART I: CARACAS,
H. G. Knight.
Common Ground, Vol 1, No 4, p 93-102 (1975).

Descriptors: *Water resources development, *Political aspects, *Law of the sea, *International law, *Conferences, Water law, International waters, International commissions, Foreign waters, Treaties, Publications, Federal government, Planning, Boundary disputes, Legal aspects, Oceans.
Identifiers: *Coastal waters, *Territorial seas(Jurisdiction).

Although looked upon as an opportunity for constructive progress, the Third United Nations Conference on the Law of the Sea served little purpose other than to demonstrate the apparent inability or unwillingness of the community of nations to deal with the issues and to negotiate acceptable law of the sea solutions. In recent years technological developments and world energy and food needs have been accompanied by a rising tide of extended national claims over maritime territory. Such extentions result in potential conflicts when no global policy concerning such extensions and resulting limited access have been formulated. The author feels the conference resulted in no such constructive effort and was merely a preparatory conference dominated by political and ideological splits. The conference was too large to work effectively and attempted to deal with too many issues which had not been properly drafted for presentation. (Welch-Florida)
W77-06550

CONSTITUTIONALITY OF STATE FISHING ZONES IN THE HIGH SEAS: THE OREGON FISHERIES CONSERVATION ZONE ACT,
Oregon Univ., Eugene. School of Law.
J. W. Ring.
Oregon Law Review, Vol 55, No 1, p 141-53 (1976).

Descriptors: *Oregon, *Fisheries, *International waters, *Federal jurisdiction, *International law, *Constitutional law, Boundary disputes, Fishing, Fish management, Fish conservation, Regulation, Legislation, Water law, Marine fisheries, Commercial fishing, State jurisdiction, Political aspects, Federal-state water rights conflicts, Water rights, Jurisdiction.
Identifiers: *Coastal waters, *Territorial seas(Jurisdiction).

This article examines the recent Oregon Fisheries Conservation Zone Act. The Act creates a fisheries conservation zone which extends forty-seven miles beyond the federally established maritime boundary and empowers the state to study and regulate all marine commercial fishing within that zone. Such state-created fisheries zones extending beyond the traditional three mile limit raises serious constitutional issues. A state may constitutionally regulate its citizens and their vessels on the high seas when the state has a legitimate interest in such regulation. The author discusses the limits of state jurisdiction and the foreign relations power question which arises as a result of such unprecedented state action. The author suggests that Oregon is without power to extend its state jurisdiction beyond the three mile limit even though federal law has created an exclusive nine mile fisheries zone. Oregon's new law must also pass the supremacy clause question to determine whether it is preempted by positive federal law, either by international agreement or by congressional legislation. The author contends that as economically advantageous as the law may be, Oregon cannot regulate commercial fishing by citizens other than its own in waters beyond the territorial sea. (Welch-Florida)
W77-06551

WATER QUALITY CONTROL AND TAX INCENTIVES: A PANACEA FOR WATER POLLUTION,
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W77-06552

THE NAVIGABILITY CONCEPT IN THE CIVIL AND COMMON LAW: HISTORICAL DEVELOPMENT, CURRENT IMPORTANCE, AND SOME DOCTRINES THAT DON'T HOLD WATER,
International Business Machine, Armonk, N. Y.
G. J. MacGrady.
Florida State University Law Review, Vol 3, No 4, p 511-615 (Fall 1975).

Descriptors: *Navigable waters, *Ownership of beds, *Legal aspects, *High water mark, Low water mark, Beds, Beds under water, Boundaries(Property), Navigable rivers, Seashores, Tidal waters, Banks, Civil law, Common law, Navigation, Bodies of water, Public access.
Identifiers: *Public trust doctrine, Navigability tests, Navigability.

Navigability developed under the civil and common laws as a determinant of the public or private character of waters, and was an extension of the same concepts as applied to other forms of property. In England and in the United States, the public ownership of navigable waters was embodied in the public trust doctrine. While American courts purport to base the application of this doctrine on English precedent, the concept was actually developed at about the same time in both countries, and was based only on the statements of text writers. Current definitions of navigability have developed both at the federal level to delineate federal controls and determination of state titles, and at the same level as a mechanism for the allocation of property interests between the public and private sectors. Presently, there is some impetus toward attching the public characteristics of navigable waters to dry land areas such as beaches, in order to maintain public access and view. The law thus responds, as from the beginning of the navigability concept, to protect the important concern of ever-diminishing natural resources. (Molloy-Florida)
W77-06553

POLYCHLORINATED BIPHENYLS.
For primary bibliographic entry see Field 5C.
W77-06554

OIL POLLUTION LIABILITY (HEARINGS ON HR 9294, 10969, 10363, 10756 WHICH PROVIDE A COMPREHENSIVE SYSTEM OF LIABILITY FOR OIL SPILL DAMAGE AND CLEANUP COSTS),
For primary bibliographic entry see Field 5G.
W77-06555

MINERAL RESOURCES OF THE DEEP SEABED (HEARINGS ON HR 11879 TO PROMOTE ORDERLY CONSERVATION AND DEVELOPMENT OF THE MINERAL RESOURCE OF THE DEEP SEABED).
Hearings-Subcommittee on Mines and Minings--Committee on Interior and Insular Affairs, U.S. House of Representatives, May 18, 20, 24, 1976, Serial No. 94-57. 486 p.

Descriptors: *Mineral industry, *Resources development, Water quality, Mining, Natural resources, Economics, Governmental interrelations, International commissions, Political aspects, Metals, Manganese, Continental shelf, Marine geology, Marine animals, Marine plants, Environmental effects.
Identifiers: *Deep Seabed Hard Minerals Act, *Congressional hearings, *Seabeds, *Minerals, Licenses, Balance-of-payments.

Two major purposes lie behind the proposed Deep Seabed Hard Minerals Act. First, it attempts to stablish a national program to promote orderly development of certain resources om the deep seabed, pending the institution of an international regime for that purpose. It also seeks to protect the quality of the marine environment from hard mineral development effects. Since the United States' demand for hard minerals increasingly exceeds domestic sources of supply, the nation depends upon foreign sources of supply. This not only affects the national, alance-of-payments position, but is also crucial to national security interests. Manganese nodules on the ocean floor may be an abundant alternate source of certain necessary minerals. Such nodules, which lie outside territorial limits and beyond the Continental Shelf, may be used by any nation. United States mining companies e prepared to make the capital investment to develop and process these minerals. This proposed bill will provide interim legislation which will utilize the technology and capability of these companies and encourage further efforts to insure national access to deep seabed hard minerals. The bill addresses licensing procedures, criteria and limitations among other aspects. (Rieck-Florida)
W77-06556

ORGANIC CHEMICAL CONTAMINANTS--CONTROL OPTIONS IN DRINKING WATER (PROPOSED).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-06557

CERTIFICATION PROCEDURES AND DESIGN AND CONSTRUCTION REQUIREMENTS FOR MARINE SANITATION DEVICES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5D.
W77-06558

DEMERY V WILMAR PLYWOOD, INCORPORATED (LIABILITY FOR ALTERATION OF NATURAL DRAINAGE PATTERNS).
338 So.2d 741-44 (La. Ct. App. 1976).

Descriptors: *Louisiana, *Drainage, *Surface runoff, *Lumbering, *Wood wastes, Water control, Surface waters, Drainage patterns(Geologic), Ponding, Damages, Flood damage, Floods, Legal aspects, Louisiana, Overflow, Industrial wastes, Judicial decisions.
Identifiers: *Liability, *Proximate causation.

Plaintiff property owner sought damages as a result of defendants's release of large quantities of water and waste material onto plaintiff's two acre tract. Defendant plywood plant installed a recirculating pond to sprinkle logs at 37,000 gallons per day. Debris from the logs was recirculated back into the million-gallon pond. Plaintiff's adjacent property was at a lower elevation than the plywood plant, and another nearby pond had enlarged to cover most of the plaintiff's property. Testimony indicated there was natural drainage over plaintiff's property, but that water did not start to back up until after the plant was built. Plaintiffs also testified to the inability to rebuild a house because of the water and the related deaths of hogs, geese, chickens, and ducks. Defendants admitted the overflow of their pond, but attempted to implead a railroad for allowing a rainage pipe under their tracks to become clogged. The court concluded that the quantity of water released by defendant caused the damage, not the railroad's contribution. The plant altered the natural drainage pattern by its discharge of large amounts of water and liability was thereby established. (Molloy-Florida)
W77-06559

TRAIN V COLORADO PUBLIC INTEREST RESEARCH GROUP, INC. (NO AUTHORITY UNDER FEDERAL WATER POLLUTION CONTROL ACT TO REGULATE DISCHARGE OF THE SOURCE, BY PRODUCT AND SPECIAL NUCLEAR MATERIALS COVERED BY ATOMIC ENERGY ACT).
96 S. Ct. 1938-49 (1976).

Descriptors: *Federal Water Pollution Control Act(FWPCA), *Nuclear energy, *Nuclear wastes, *Discharge(Water), Waste water(Pollution), Pollutants, Pollutant identification, Federal jurisdiction, Environmental control, Environmental effects, Environment, Nuclear engineering, Radioactivity, Radioactive wastes, Radioactive waste disposal, Disposal, Water law, Navigable waters, *Colorado.
Identifiers: *Administrative regulations.

Plaintiff Colorado-based organization and Colorado residents brought a citizen suit to compel defendant Administrator of the Environmental Protection Agency (EPA) to perform his statutory duty to control discharges of radioactive materials into navigable waters. Plaintiffs contend that under the Federal Water Pollution Control Act (FWPCA) it is unlawful to discharge any 'pollutant' into the navigable waters without a permit from EPA and that FWPCA includes 'radioactive materials' within its definition of 'pollutant'. Defendant answers that under the Atomic Energy Act the Nuclear Regulatory Commission issues regulation governing the discharge of radioactive materials, and that the EPA administrator had disclaimed any authority under the FWPCA to regulate such discharges. The Supreme Court held that the legislative history of FWPCA showed a clear, congressional intention not to alter the authority of the Nuclear Regulatory Commission in its control over the discharge of source, by-product and special nuclear materials. The EPA administrator had properly disclaimed his power to regulate these discharges under the FWPCA which are governed by the Atomic Energy Act. (Welch-Florida)
W77-06560

UNITED STATES V. WINNEBAGO TRIBE OF NEBRASKA (SEVERANCE DAMAGES IN EMINENT DOMAIN PROCEEDINGS).
542 F.2d 1002-08 (8th Cir. 1976).

Descriptors: *Eminent domain, *Groundwater, *Impounded waters, *Damages, Compensation, Judicial decisions, Treaties, Recreation, Agriculture, Legislation, Water table, Land tenure, Federal government, Severance, Easements, Condemnation, Legal aspects, *Indian reservations, Remedies, Condemnation value, Missouri River, Nebraska.
Identifiers: *Severance damages.

Plaintiff United States brought suit against certain landowners to acquire land by eminent domain for use in the Missouri River Recreation Lakes Project. The comdemnation commission awarded compensation for the land taken based on its recreational value. The commission also awarded severance damages for certain other lands to compensate for the diminution in the agricultural value of the lands due to the higher ground water table resulting from impounding water for the project. On appeal, the District Court upheld the findings of the commission except that it determined that some of the awards should be based on a lower value for agricultural use. The United States Eighth Circuit Court of Appeals found that an award of severance damages was not proper for the diminished agricultural use. The court said the proper remedy lay in the Tucker Act for a taking in the form of an easement. The court also held that the Corps of Engineers was without authority to take Indian tribal lands by eminent domain since there had been no express Congressional abrogation for this project of the treaty holding the Indian lands in trust. (Capehart-Florida)
W77-06561

MCCAY V RB POTASHNICK CONSTRUCTION COMPANY (ABSOLUTE LIABILITY FOR DAMAGE RESULTING FROM NATURAL WATERCOURSE OBSTRUCTION).
539 Sw2d 323-25 (Mo Ct App 1976). 3 p.

Descriptors: *Missouri, *Natural streams, *Impoundments, *Farm ponds, *Road construction, Embankments, Floods, Flood damage, Erosion, Overflow, Annual flood, Watercourses(Legal aspects), Surface waters, Courts, Judicial decisions, Legal review, Legal aspects, Crops, Field crops, Damages, Negligence, Trespass.
Identifiers: *Absolute liability, Intentional torts.

Defendant highway construction company constructed a highway bridge approach across a natural watercourse which was used by plaintiff farmer to drain his lands following annual river overflows. In a subsequent year the river overflow caused the bridge approach to erode and fill the plaintiff's field drains with soot and soil. As a result, plaintiff lost a year's crops. The trial court awarded plaintiff damages for the lost crops and defendant appealed. The appelate court affirmed on two grounds: the evidence was substantial and the verdict not contrary to its weight; the law was not erroneously stated or applied. The court stated its position concerning the impoundment of waters on others' lands. Regardless of whether it was accidental or intentional, or accompanied by negligence or not, the agency causing the overflow of a natural watercourse to the damage of adjacent property owners is liable for its misfeasance in an action of trespass. (Moorhouse-Florida)
W77-06562

BENTLEY V. INDUSTRIAL FIRE PROTECTION COMPANY (LIABILITY FOR INCREASING DRAINAGE ONTO ADJOINING PROPERTY).
338 So.2d 1177-82 (La. Ct. App. 1976).

Descriptors: *Louisiana, *Erosion, *Adjacent landowners, *Drainage, Construction, Land tenure, Ditches, Natural flow, Damages, Judicial decisions, Legal aspects, Drainage effects, Surface runoff, Construction equipment, Trespass.

Plaintiff landowner sought recovery from defendant landowner for damages to the plaintiff's property. The defendant's property drained naturally onto the plaintiff's land. The defendant graded a part of his land to allow construction of a building. The defendant attempted to restore the natural drainage patterns. The plaintiff contended that a substantial amount of erosion had occurred result-

ing in the collection of drainage water on plaintiff's land in greater amounts than before the construction. The trial court held that the erosion caused by the defendant's construction activities had placed a specific burden on the plaintiff's property. The court awarded damages to the plaintiff. The Second Circuit Court of Appeal of Louisiana affirmed holding that the defendant was not relieved from responsibility simply because his property was the dominant estate for drainage across the plaintiff's servient estate. (Capehart-Florida)
W77-06563

HYLAN FLYING SERVICE, INCORPORATED V. STATE (STATE CONSTRUCTION OF DRAINAGE DITCH ON PRIVATE LAND CONSTITUTES COMPENSABLE TAKING).
388 N.Y.S. 2d 444-47 (App. Div. 1976).

Descriptors: *New York, *Judicial decisions, *Ditches, *Drainage systems, *Condemnation, Legal aspects, Legal review, Cities, Compensation, State government, Local government, Easements, Condemnation value, Construction, Eminent domain, Public benefits, Public rights.
Identifiers: *Inverse condemnation, *De facto appropriation, Consequential damages, Direct damages.

Plaintiff developer sought compensation for the de facto appropriation if its land by the entrance and construction of a drainage ditch thereon by the state of New York. The state, the plaintiff and a nearby town had been negotiating for time concerning the construction of the ditch in question. The plaintiff was to grant an easement to the town in return for their agreement to maintain the state constructed ditch. Due to a misunderstanding, the easement and agreement were not executed but the state entered and built the drainage ditch as proposed. The appellate division affirmed the lower court's holding that such an action constituted a de facto taking as it interfered permanently with plaintiff's physical use and possession of the property and did serve a public purpose in that it provided drainage from a state highway. While also agreeing that the plaintiffs were not entitled to consequential damages, the appellate court found them entitled to direct damages and reversed for a determination of the appropriate amount thereof. (Moorhouse-Florida)
W77-06564

ROYCE V. HENEAGE (OBSTRUCTION OF A NATURAL STREAM DOES NOT CONSTITUTE OBSTRUCTION OF LOWLANDS DRAINAGE).
365 A.2d 1109-14 (Conn. 1976).

Descriptors: *Connecticut, *Judicial decisions, *Obstruction to flow, *Dams, Natural flow, Legal aspects, Water law, Riparian rights, Streamflow, Wetlands, Legal review, Riparian land, Cities, Local governments, Drainage, Land reclamation, Legislation.
Identifiers: *Lowlands, *Dam effects.

Plaintiffs, lower riparian property owners, sought damages for the removal of a dam located on their property and an injunction to prevent town officials from removing a newly constructed dam. Defendant town officials couterclaimed to enjoin maintenance of the dam. Judgment was entered for the defendants. Plaintiff's own property is adjacent to property owned by one O'Keefe. A stream flows across the O'Keefe property and onto plaintiff's lot. Plaintiffs constructed a dam across the stream which caused flooding and erosion of the O'Keefe property. The O'Keefe's complained to the town selectman, who in turn ordered the obstruction removed as per Connecticut Statute 52-461. On appeal the majority held that 52-461 referred only to the drainage of low lands meaning marshes or similar wetlands and did not authorize the city officials to remove the obstruction absent a full judicial hearing on the controversy. Two justices dissented arguing that the statute was unambiguous and required no interpretation--a low land was being drained by the natural course of a stream now obstructed. A new trial was ordered. (Moorhouse-Florida)
W77-06565

STATE V. SIEMINSKI (STATE'S RIGHT TO REGULATE SCALLOP FISHING IN THE HIGH SEAS).
556 P.2d 929-35 (Alas. 1976).

Descriptors: *Alaska, *Fishing, *State jurisdiction, Water resources development, Federal-state water rights conflicts, Water rights, Legislation, Regulation, Conservation, Natural resources, Administration, State governments, Federal government, Legal aspects, Judicial decisions, Governmental interrelations.
Identifiers: *Scallops, *High seas, Territorial waters, Supremacy clause.

Defendant was convicted for violating an Alaskan state statute prohibiting the taking of scallops beyond the state's territorial waters. Defendant, having taken scallops from nine miles offshore, protested that the state regulation did not apply to conduct occurring beyond the territorial limit of three miles from the Alaskan coast. He further contended that any attempt to regulate beyond this limit violated the supremacy clause which gave the federal government exclusive jurisdiction of the area. In view of evidence that the state had a valid interest in the scallops industry, and that in order to protect scallops within territorial waters it was necessary to regulate taking of scallops beyond those waters, the Supreme Court of Alaska held that the statute was a valid exercise of the state's police power. This regulation may be applied only against persons having a requisite minimum relationship with the state, such as citizenship. The right of the state to prosecute for illegal scallop fishing in territorial waters is not precluded by any paramount federal law. (Rieck-Florida)
W77-06566

LOWREY V. HODGES (TEMPORARY PERMITS TO USE GROUND WATER FOR IRRIGATION).
555 P.2d 1016-25 (Okla. 1976).

Descriptors: *Oklahoma, *Irrigation, *Irrigation permits, *Water distribution(Applied), *Beneficial use, Water sources, Water permits, Water rights, Hydrologic data, Legislation, Legal aspects, Regulation, Irrigation water, Non-consumptive use, Preferences(Water rights), Aquifer management, Groundwater, Aquifers.

Appellants sought a permit to take and use waters from an aquifer for irrigation purposes. Appellees, owners of adjacent land, protested the application on the basis that it failed to meet statutory requirements, and that it would create waste. The Supreme Court of Oklahoma held that irrigation for the purpose of producing food and fiber is a beneficial use, therefore the permit should be approved by the state's water resources board. The court also held that the permit applicant must show what method he will use for irrigation, whereupon the board has authority to determine if waste will occur. The third major issue decided by the court was that the issuance of a temporary permit did not circumvent the legislative requirement of a hydrologic survey before a regular permit will be issued. The fact that temporary permits must be revalidated annually subjects them to review on a yearly basis. The court concluded that since appellants proved that they intended to put the water to a beneficial use, and since no evidence was offered to show that waste was likely to occur, the appellants should be issued a temporary permit. (Rieck-Florida)
W77-06567

COASTAL PUBLIC LANDS MANAGEMENT ACT OF 1973.
Tex. Rev. Civ. Stat. art 5415e-1, secs 1 thru 12 (Supp. 1976).

Descriptors: *Texas, *Comprehensive planning, *Construction, Coastal plains, Coasts, Planning, Regulation, Recreation, Recreation facilities, Preservation, Protection, Legal aspects, Water rights, Legislation, Coordination, Management, Administration, Building codes, Wildlife habitats, Estuarine environment, Research facilities, Engineering.
Identifiers: *Coastal Lands Public Management Act of 1973(Tex), Coastal Zone Management Act of 1972, Historical sites.

The Coastal Lands Public Management Act of 1973 provides for the preservation of the natural resources of the surface estate on coastal public lands in Texas. The school land board must administer and enforce the provisions of the Act. The board shall develop a continuing comprehensive coastal public lands management program in compliance develop a continuing comprehensive coastal public lands management program in compliance with the Coastal Zone Management Act of 1972. The board may also regulate construction and use of all structures built on coastal public lands. It has authority to purchase fee and lesser interests in coastal area lands for the creation and preservation of wildlife refuges, estuarine preserves, historical sites, recreational areas and research facilities. These areas must be acquired by purchase, not by condemnation. The board is also authorized to study various coastal engineering problems, lease coastal lands for public purposes and grant easement rights to owners of adjacent littoral property authorizing placement of certain structures subject to conditions under the Act. (Reick-Florida)
W77-06568

DISTRIBUTION OF WATER TO CONSUMERS.
Idaho Code Ann. secs. 42-901 thru -916 (1948).

Descriptors: *Water distribution(Applied), *Water management(Applied), *Water measurement, *Water delivery, Measurement, Water levels, Water transfer, Water conveyance, Water users, Appropriation, Control structures, Ditches, Diversion, Water rates, Prior appropriation, Permits, Damages.
Identifiers: Perpetual rights, Liens.

Owners of ditches, canals, or laterals in Idaho shall appoint watermasters whose duty it shall be to measure the amount of water flowing to each person entitled to a certain pro rata share. Persons who divert water from ditches without the consent of the watermaster, or who wrongfully interfere with headgates, flumes or ditches may be liable for triple damages. Persons and companies distributing water for a fixed charge must provide necessary gates and measuring devices, to render possible and practical a measurement of the quantity of water being delivered to the consumer. Whenever any ditch, canal or reservoir serving several users has one or more priorities by reason of enlargements resulting from reclaimed lands, the right of lands being irrigated shall be divided into classes. Parties may contract for the delivery of water. The amount to be paid for such delivery constitutes a first lien upon the land for the irrigation. However, if title to the land is in the United States or the state of Idaho, then the amount shall be a first lien on the crops raised on the tract. Where two or more parties take water from a ditch at the same point, they shall select a manager for distribution of the water. The manager is authorized to order repairs and assess necessary costs to maintain laterals and headgates. Waters appropriated for agricultural or domestic uses shall be deemed exclusive and continuous dedications to such uses. Perpetual water rights may be purchased. Thereafter, such rights are not affected by liens or mortgages. Persons wasting water are liable for

damages to those harmed therefrom. (Josepher-Florida)
W77-06569

SHORELINE SETBACKS,
Hawaii Rev Stat secs 205-31 thru -37 (Supp 1975).

Descriptors: *Hawaii, *Legislation, *Shores, *Coastal structures, Coasts, Harbors, Piers, Coastal engineering, Beaches, Retaining walls, Shore protection, Sea walls, Local governments, Marinas, Permits, Planning, Zoning, Water law, Comprehensive planning, Legal aspects.
Identifiers: *Coastal zone management, Coastal water.

Hawaii has directed its land use commission to establish setbacks along shorelines of not less than 20 feet, nor more than 40 feet inland from the upper reaches of the wash of wanes. Within the shoreline area it shall be unlawful to remove sand, coral, rocks or soil subject to limited exceptions; construction of any seawalls and similar structures is prohibited except that nonconforming structures in existence and those necessary for safety are allowed; nonconforming structures in use may be replaced or reconstructed if not enlarged. The planning department of each county shall administer this act and review all plans for proposed structures and facilities in shoreline areas. The department's recommendations shall be submitted to the zoning commission which may grant a variance if the structure is deemed in the public interest. Tunnels, canals, basins, harbor improvements, and sport recreational facilities as well as governmental structures are exempt from this act and shall be permitted subject to approval of the county planning department and a public hearing. In the event that conflict arises between provisions and any other state law or county ordinance the more restrictive shall apply. (Moorhouse-Florida)
W77-06570

MISCELLANEOUS PROVISIONS ON WATER RIGHTS, USES AND PROTECTION,
Ore. Rev. Stat. secs. 541.010 thru (.545 (1973).

Descriptors: *Oregon, *Water distribution(Applied), *Water utilization, *Impounded waters, Electric power production, Right-of-way, Dam failure, Water works, Stream gages, Impoundments, Dam design, Water delivery, Water supply, Water injury, Water resources, Dams, Water law, Water rates, Water rights, Water supply developments, Irrigation practices, Irrigation operation and maintenance.

The sale or distribution of waters from Oregon's lakes and streams is a public use under the Act or 1891. Rates for the uses of water under this section are fixed by legislative authority. Corporations which have constructed ditches, canals, or flumes under the Act of 1891 must control waste therefrom, erect and maintain headgates and necessary embankments, and be liable for damages caused by negligent maintenance. The 1899 Act declares that the use of state waters for the development of electric power and mineral resources is a public and beneficial use. Rights of way for ditches, pipelines and canals across state land are granted under the 1899 Act and joint use of ditches is encouraged. Oregon shall cooperate with the federal government in land title matters relating to the Reclamation Act of 1902. Owners of land bordering state waters may use machinery to raise water levels necessary for irrigation purpose provided that the use does not conflict with a better or prior right. 'Splash dams', which release waters suddenly to aid in the flotation of logs downstream, are unlawful. Similarly, the release of water from impoundment or diversion structure is subject to regulation when public safety is endangered. Emergency release of impounded waters is permissible after notice is given to parties who will be affected by the release. (Josepher-Florida)
W77-06571

APPROPRIATION OF WATER GENERALLY (REGULATION OF SURFACE WATER APPROPRIATION THROUGH A PERMIT PROGRAM),
Ore. Rev. Stat. secs. 537.010 thru .450 (1973).

Descriptors: *Appropriation, *Water permits, *Water allocation(Policy), *Surface water availability, *Oregon, Water supply, Water supply development, Legislation, Surface waters, Public access, Public benefits, Public rights, Beneficial use, Regulation, Water users, Water utilization, Water policy, Economics, Groundwater basins.
Identifiers: *Vested rights, *Inchoate rights.

All water within the state of Oregon from all sources of water supply belongs to the public. All waters within the state may be appropriated for beneficial use, subject to the vested rights of any person to any water or to the use of any water. Any person intending to acquire the right to the beneficial use of any water shall apply to the State Engineer for a permit to make such appropriation. No person shall use, store, or divert any waters until after the issuance of a permit. Appropriation of surface water for the purpose of recharging groundwater basins or reservoirs is considered a benefitcial purpose for which a permit may be granted. Applications for permits must indicate the source of water supply, the nature and amount of the proposed use, the location of the work, the time for initiation of construction, and the time necessary for completion. The State Engineer may reject the application, or he may refer it to the State Water Resources Board for consideration. The Board shall have due regard for conserving the highest use of the water for all purpose, the maximum economic development of the waters, the prevention of wasteful or unreasonable use of the waters, and all vested and inchoate rights to the waters of the state. Whenever the owner of a permit to appropriate fails to commence work within the time required by law or fails to prosecute the work with reasonable diligence the State Engineer may cancel the permit. (Cowart-Florida)
W77-06572

SIERRA CLUB V LESLIE SALT COMPANY (DEFINING NAVIGABLE WATERS JURISDICTIONALLY UNDER RIVERS AND HARBORS APPROPRIATION ACT OF 1899 AND THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972),
412 F Supp 1096-1104 (ND Cal 1976).

Descriptors: *Jurisdiction, *Permits, *Dikes, *High water mark, *California, Salts, Bays, Navigable waters, Rivers and Harbors Act, Tides, Marshes, Dredging, Tidal waters, Federal government, Administrative agencies, Estuaries, Watercourses(Legal aspects), Federal jurisdiction.
Identifiers: *Evaporation ponds, Injunctive relief, FWPCA Amendments of 1972, Estoppel, Navigability tests, Salt production, Mean higher high water.

Plaintiff citizens' groups sought an injunction to require defendant corporation to remove dikes from the shores of San Francisco Bay. Defendant corporation was the plaintiff in another action where it sought a declaratory judgment that defendant federal agency's assertion of jurisdiction above the mean high water (MHW) line was unlawful. These actions were consolidated. The corporation owned property along the bay on which it had built diked evaporation ponds for salt production. Construction of the dikes began in 1860 with most of them completed by 1927, the bulk of the property lies between the MHW line and the mean higher high water (MHHW) line. The United States District Court for the Northern District of California held that the jurisdiction of defendant agency extended to the MHHW line thus allowing the agency to require permits for the discharge of dredge and fill and for any new construction up to this line. The court further held that the agency was estopped from requiring permits for any structures which had been in existence a long time. (Capehart-Florida)
W77-06573

PINELLAS COUNTY V. LAKE PADGETT PINES (WATER RESOURCES ACT AND EFFECT OF WATER WITHDRAWAL PROJECT),
333 So.2d 472-80 (2d DCA Fla. 1976).

Descriptors: *Municipal water, *Water supply, *Water wells, *Local governments, Leglislation, Public utility districts, Water districts, State governments, Regulation, Water resources development, Well regulations, Groundwater, Water consumption(Except consumptive use), Imported water, Water demand, Damages.
Identifiers: *Standing(Legal), Well fields.

Plaintiff-developer sought to enjoin municipal pumping from nearby well field, and alleged that construction of the well field constituted a development which had regional impact, and which was proceeding without compliance with relevant statute. In addition, plaintiff pleaded damage different in kind from that of the general public, in that the pumping would jeopardize water supply from plaintiff's wells, lower the level of plaintiff's lakes, and cause other land damage. The trial court granted summary judgement for the plaintiff, which was reversed. The appellate court held that plaintiff, as a private landowner with damages materially different in kind from those effecting the public generally, had the capacity and the requisite standing to litigate the question. The well field was not viewed as a development which would have environmental repercussions, including an impact on water resources as viewed by the state. Instead, the project was specifically designed to provide water for already existing developments in urban areas, and thus was regulated by a different statute, the Water Resources Act. The legislature believed environmental concerns would be better met by regulating water supply developments solely under appropriate governmental agencies. (Molloy-Florida)
W77-06574

CALIFORNIA-NEVADA INTERSTATE COMPACT.
West Cal Water Code Ann secs 5975 thru 5976 (West 1971).

Descriptors: *California, *Nevada, *Interstate compacts, *Interstate commissions, *Interstate rivers, Water law, Rivers, Equitable apportionment, Legal aspects, Political aspects, State governments, Federal government, Insterstate, River basin commissions, Water resources development, Legal review, Reservoirs, Surface waters, Groundwater, Springs, Subsurface water.
Identifiers: *California-Nevada Interstate Compact, *California-Nevada Compact Commission, *Lake Tahoe Basin, *Truckee River Basin, *Carson River Basin, *Walker River Basin, Administrative regulations.

California and Nevada have entered into a compact for the more efficient determination of water rights between the states. A commission consisting of five representatives from each state as well as one federal representative has been established to enforce the Compact's provisions. Any citizen who feels that the Compact has been violated is permitted to report to the commission. The commission will enforce the Compact's provision in the appropriate court of the state in which a violation has occurred. The relative rights of both California and Nevada regarding the use of water from the Lake Tahoe Basin, the Truckee River Basin, the Carson River Basin and the Walker River Basin are set out in detail in the compact. Each state is allowed to make any use of groundwater and springs provided such use does not interfere with the natural flow of water in the other state. The states are free to change the use of

water assigned to them provided such change does not adversely affect the allocation of water to the other state. The use of all waters for the preservation, protection, and enhancement of fish, wildlife, and recreation is explicitly recognized. Either state which imports water is guaranteed the exclusive use of that water. (Moorhouse-Florida)
W77-06575

WATER DIVISIONS AND SUPERINTENDENTS.
Wyo Stat Ann secs 41-54 thru 41-60 (1959), as amended (Supp 1971).

Descriptors: *Water distribution(Applied), *Wyoming, *Water districts, *Water storage, *Administrative agencies, Legislation, Water utilization, Administration, Governments, Legal aspects, Regulation, Water law, Institutions, State governments, Water policy, Water resources, Permits, Ditches, Canals, Laterals, Reservoirs, Water rights, Decision making, Jurisdiction, Water transfer, Prior appropriation.
Identifiers: Water commissioners.

The state of Wyoming is herein divided into four water divisions, each governed by a superintendent appointed by the governor. Under prior law the superintendent was to hold office for four years, or until his successor was appointed. The 1971 Amendments provide that the superintendent shall serve instead at the pleasure of the governor. Qualification for the position shall be determined by examinations conducted by the state engineer. Each division superintendent shall have general control over the water commissioners of the several districts within his division. He shall execute the laws relative to the distribution of water in accordance with the rights of priority of appropriation. He shall regulate and control the storage and use of water under all rights of appropriation which have been adjudicated by the board of control or the courts, and regulate and control the storage and use of water under all permits approved by the state engineer. The powers of the superintendent shall include: construction of suitable ditches to carry return waters to the main stream or waste way; determination of the owners of all canals, ditches, laterals or reservoir outlets; regulation to secure equal and fair distribution of water in accordance with the rights of priority of appropriation. (Cowart-Florida)
W77-06576

DAMAGE BY FLOATING TIMBER.
Wyo. Stat. Ann. sec. 6-236 (1959).

Descriptors: *Wyoming, *Irrigation, *Lumbering, *Streams, *Streamflow, Legislation, Irrigation canals, Irrigation ditches, Irrigation water, Ditches, Beneficial use, Forestry, Lumber, Running waters, Rivers, Legal aspects, Penalties(Legal), Water law, Competing uses.
Identifiers: Criminal offense.

Any person or corporation floating logs down any stream in the state of Wyoming who negligently or purposely permits such logs to interfere with or obstruct the flow of water into any irrigation ditch is guilty of a criminal offense. Similar interference with the lawful use of water for irrigation purposes is also proscribed. However, if the owner of such irrigation ditch or user of water for irrigation purposes has consented to the interference, it shall be allowed. Conviction hereunder is punishable by a fine of not less than one thousand dollars. (Moorhouse-Florida)
W77-06577

IMPROVEMENT DISTRICTS.
Utah Code Ann. sec. 17-6-1 (1973).

Descriptors: *Utah, *Water distribution(Applied), *Water management(Applied), *Water districts, Watershed management, Jurisdiction, Legal aspects, Local governments, Drainage systems, Legislation, Flood control, Flood routing, Sewerage, Governments, Sewage districts, Drainage districts.
Identifiers: *Water management districts, Improvement districts.

The state of Utah herein authorized the establishment of improvement districts for the acquisition and operation of water and sewage systems, and flood water collections, retention, and disposition systems. The districts may include all or part of any county or counties including incorporated areas. Each district established hereunder is granted exclusive authority within its jurisdiction and no other district may be created to own or operate similar facilities. (Moorhouse-Florida)
W77-06578

COLORADO RIVER COMPACT.
Utah Code Ann secs 73-12a-1 thru -3 (1958).

Descriptors: *Utah, *Colorado River Compact, *Interstate compacts, *Water resources development, *Colorado River, Colorado River Basin, River basins, Rivers, State governments, Legislation, Planning, Water allocation(Policy), Regulation, Water rights, Water resources, Water policy, Institutions, Administrative agencies, Legal aspects.

The Colorado River Compact as adopted by the Colorado River Commission was approved for and by the state of Utah. The compact provided for the equitable division and apportionment of the use of the waters of the Colorado River system, to reduce controversies and secure expeditious development of the river basin. The Colorado River System was divided into the Upper Basin, including Arizona, Colorado, New Mexico, Utah, and Wyoming; and the Lower Basin, including Arizona, California, Nevada, New Mexico, and Utah. Both basins were apportioned the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per year, increasing yearly for the Lower Basin. First rights of any water apportioned by treaty to Mexico by the federal government were recognized. Navigational and hydro-electric uses were adjusged subservient to consumptive use, and provisions for settlement of disputes were established. This compact did not purport to impair present perfected rights to the Colorado waters, but such rights were to come out of the apportioned share. It is noted that states could pursue legal actions for protection of compact rights without resorting to the compact's dispute procedures. (Molloy-Florida)
W77-06579

WATER POLLUTION; POWERS OF STATE WATER POLLUTION CONTROL BOARD.
Utah Code Ann secs 73-14-1 thru -6 (1968).

Descriptors: *Utah, *Water pollution control, *Waste disposal, *Water quality control, *Water treatment, Governments, Administration, Permits, Legal aspects, Waste treatment, Public health, Sewage treatment, Treatment facilities, Water disposal, Industrial wastes, Municipal wastes, Environmental effects, Regulation, Waste water(Pollution), Legislation, State governments, State jurisdiction.
Identifiers: *Nuisance(Legal aspects).

The public policy of the state of Utah is to prevent water pollution, control discharge of untreated waste, and eliminate public health hazards. The act defines: polluion, wastes, sewerage system, treatment works, disposal system, and water of the state. A committee on water pollution is established. This committee is comprised of nine members who represent the various industrial, municipal and environmental interests of the state. The committe shall develop programs for the abatement of water pollution, advise other state agencies, administer federal grants, conduct research relating to water pollution, disseminate information, adopt standards of quality, enforce rules and regulations pursuant to pollution, review plans of disposal systems, and issue permits for waste discharge. The act declares pollution to be unlawful, and considers it a public nuisance. It is also unlawful to contruct treatment works or increase the volume of waste discharge without first obtaining a permit from the committee on water pollution. In order to effectuate this program the wastes of the state are grouped into reasonable classes and assigned standards of quality. (Rieck-Florida)
W77-06580

WATER RIGHTS GENERALLY.
Wyo. Stat. Ann. secs. 41-2 thru 41-25 (1959), as amended, (Supp. 1971).

Descriptors: *Wyoming, *Water rights, *Beneficial use, Legislation, State governments, Irrigation, Reservoirs, Irrigated land, Water utilization, Administration, Legal aspects, Regulation, Institutions, Water management(Applied), Competing uses, Appropriation, Proration, Diversion, Reasonable uses, Relative rights, Public benefits.

Water rights in Wyoming can be acquired under the applicable laws regarding beneficial use of water. Procedures for changing beneficial use are set forth by statute. The 1971 amendments of redefine irrigated acreage, which is acreage needing irrigation, and lying outside the reservoir basins, but not including submerged lands. Irrigated acreage is no longer limited to new land, but also includes lands within the same drainage area having water rights from another source, and which have a need for supplemental water. The amendments also grant rights to use water to any person, for a period not exceeding two years for highway construction or repair, and railroad roadbed construction and repair, provided the proposed use is for a public purpose under a contract with the state. Other new provisions set forth procedures whereby the owner of a permanent water right can demand that temporary water rights be shut off until the owner's rights are satisfied. Procedures for obtaining supplemental water, water diverted from a new source of supply to aid water appropriation from a primary source, and methods of changing points of diversion are also included in the amendments. (Hadoulias-Florida)
W77-06581

ABANDONMENT OF WATER RIGHTS,
Wyo. Stat. Ann. secs. 41-47 thru 41-48 (1959).

Descriptors: *Wyoming, *Beneficial use, *Appropriation, *Water rights, Legislation, Legal aspects, Water law, Irrigation, Relative rights, Unappropriated water, Ditches, Irrigation ditches, Reservoirs, Streams, Streamflow, Water allocation(Policy), Local government, Competing uses.
Identifiers: *Abandonment(Water rights).

Wyoming has herein restricd the right to use water to that quantity necessary for irrigation or other beneficial purposes. Any water in excess of that quantity shall not be appropriated but allowed to flow in its natural stream. If the owner of any ditch or reservoir fails to use the water therefrom for irrigation or other beneficial purposes for five succesive years, the facility shall be considered abandoned, and the owner will have forfeited all rights to the appropriated water and the facility. The water is again subject to appropriation for beneficial use. The owner of an abandoned facility may not collect any royalty for the use of water carried thereby. Any water user potentially affected by a declaration of abandonment of existing water rights is qualified to initiate abandonment proceedings by presenting his case in writing to the board of control. Upon full consideration, the board shall refer well-founded claims to the appropriate division superintendent. (Moorhouse-Florida)
W77-06582

DISASTER ASSISTANCE (FLOOD MITIGATION).
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 4A.
W77-06593

PEOPLE AND THE SOUND. WATER MANAGEMENT.
Environmental Protection Agency, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06594

MANAGEMENT OF WATER AND RELATED LAND RESOURCES IN THE STATE OF MAINE,
New England River Basins Commission, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06600

6F. Nonstructural Alternatives

FLOOD CONTROL IN OKLAHOMA: AN EXAMPLE OF LAND USE PRECEDING LAND USE PLANNING,
Tulsa Univ., Okla. Coll. of Law.
For primary bibliographic entry see Field 4A.
W77-06542

FLOOD PLAIN INFORMATION: SOUTHWEST FOOTHILL STREAMS (EVANS, THOMAS, AND WHITES CREEKS AND SKYLINE WASH), RENO, NEVADA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-06583

FLOOD PLAIN INFORMATION: REDWOOD RIVER AT MARSHALL, MINNESOTA.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 4A.
W77-06584

FLOOD PLAIN INFORMATION: STONE, DARK AND KETTLE BROOKS, TOWN OF AUBURN, MASSACHUSETTS,
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-06585

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, ANDERSON AND OLINDA CREEKS, AND SPRING GULCH, ANDERSON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-06586

FLOOD PLAIN INFORMATION: WAHOO CREEK, COTTONWOOD CREEK, DRY RUN CREEK AND SAND CREEK, WAHOO, NEBRASKA,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-06587

FLOOD PLAIN INFORMATION: LITTLE SIOUX RIVER, OCHEYEDAN RIVER AND MUDDY CREEK, CITY OF SPENCER AND VICINITY, CLAY COUNTY, IOWA,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-06588

FLOOD PLAIN INFORMATION: WHITE RIVER - KILLBUCK CREEK, MADISON COUNTY AND ANDERSON, INDIANA,
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W77-06589

FLOOD PLAIN INFORMATION: OHIO RIVER, DEARBORN COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W77-06590

SPECIAL FLOOD HAZARD REPORT: SHIP CREEK, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W77-06591

FLOOD PLAIN INFORMATION: SOUTH CREEK, NORTH CREEK, CATFISH CREEK, CLOWER CREEK, ELLIGRAW BAYOU AND MATHENY CREEK, SARASOTA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W77-06592

DISASTER ASSISTANCE (FLOOD MITIGATION).
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 4A.
W77-06593

PEOPLE AND THE SOUND. FLOOD DAMAGE REDUCTION.
Army Engineer District, Boston, Mass.
For primary bibliographic entry see Field 6B.
W77-06598

6G. Ecologic Impact Of Water Development

GENERAL ECOLOGICAL CONCEPTS IN HYDROBIOLOGY AND PROBLEMS OF REGULATING FRESHWATER ECOSYSTEMS, (IN RUSSIAN),
Ivankovo State Univ. (USSR).
G. L. Shkorbatov.
Gidrobiol Zh 11(6), p 111-119, 1975.

Descriptors: *Regulation, *Hydrobiology, Ecology, *Freshwater, *Ecosystems.

Basic ecological terms as biocenose, community, hydrobiocenose, biogeocenose and ecosystem, the concepts denoted by them, their present-day interpretation and the area of science responsible for their development are discussed. When characterizing the directions of investigations and the fields of modern hydrobiology it is necessary to demarcate the concepts of the structure of the science. The main areas of hydrobiology are: aquatic demecology (population structure and intrapopulational relations of aquatic organisms), aquatic autecology (interrelation of aquatic organisms with the environment, individual adaptations) and aquatic synecology (interpopulation relations, structure and functioning of aquatic ecosystems). The directions of investigations are: production, sanitary, technical, agricultural hydrobiology, etc.--Copyright 1976, Biological Abstracts, Inc.
W77-06134

MODEST TECHNIQUES.
Mosaic, Vol. 8, No. 1, p 44-52, January/February, 1977.

Descriptors: *Arid lands, *Environmental effects, *Drainage, *Irrigation effects, Deserts, Water supply, Biomes, Ecology, Saline water, Irrigation, Surface runoff, Silts, Salts, Salinity, Subsurface waters, Environment, Technology, Greenhouses, Revegetation, Agriculture, Remote sensing, Groundwater.

The adaptability of technology to water supply problems in arid lands is discussed. In the early 1950's arid land scientists were interested in large-scale programs of bringing water to make deserts bloom. Today, most plans and goals are more modest. These are usually concerned with protecting the land from even worse incursions of man and nature, while using technology gently to minimize adverse effects and as much as possible from the fragile soil. However, some more extensive plans, typical of the 1950's, are still considered. A few are presented and evaluated in terms of their overall impact on the environment. The problems presented by silt, salts and use of subsurface waters are discussed. Controlled desert experiments, such as one conducted by the University of Arizona in northern Mexico, are discussed. One expert feels that a difficulty in applying technology to arid lands is lack of coordination or cooperation among research disciplines. (Jamail-Arizona)
W77-06237

ENVIRONMENTAL IMPACT ANALYSIS: A CASE STUDY OF THE ENVIRONMENTAL IMPACT OF THE CONSTRUCTION OF A DAM IN ZARIA PROVINCE,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Agricultural Economics and Rural Sociology.
G. O. I. Abalu.
Journal of Environmental Management, Vol 4, p 339-354, 1976. 2 tab, 16 ref.

Descriptors: *Dam construction, Rural sociology, Social participation, Surveys, Economic development, Planning, Africa, Methodology.
Identifiers: Environmental impact, Externalities, *Nigeria(Zaria Province).

An attempt is made to identify, illustrate, and measure the tradeoffs between environmental quality and development resulting from the construction of the Kubanni Dam Project in Nigeria. Specific objectives were to apply a methodological framework which incorporates environmental quality goals into dam construction, and to suggest further research needs in the analysis of dam construction and of development in general. The basic steps in the methodology applied included: (1) determining the physical impact of the dam on the surrounding environment; (2) determining the relative importance of the affected environmental resources; (3) providing an aggregate index of the environmental impact of the construction of the dam; and (4) identifying tradeoffs between society's needs and environmental quality. A survey of household heads living around the river on which dam is situated was conducted in order to rank the importance of environmental resources. Results show that: (1) backward rural people are able to rank and monetarily evaluate environmental resources; (2) citizen participation is important in planning natural resources development; (3) it is not adequate for governments to arbitrarily place market values on resources to be taken over; (4) environmental impact statements should be used as a basis for aiding decision making with respect to project choice; and (5) impact statements with direct citizen involvement are an important prerequisite for economic development. (Luedtke-Wisconsin)
W77-06352

INTEREST GROUP PERCEPTIONS OF DEVELOPMENT ISSUES IN TIDEWATER VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geography.
K. E. Smith, L. M. Springer, and J. D. Stephens.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 662, Price codes: A06 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 101, March 1977. 99 p, 15 tab, 21 fig, 56 ref, append. OWRT-A-060-VA(1).

Descriptors: *Urbanization, *Environmental effects, *Water pollution, *Virginia, Chesapeake Bay, Waste disposal, Septic tanks, Computer programs, Attitudes, Social adjustment, Sewage, Land use, Human population.
Identifiers: *Delphi techniques, *Tidewater Virginia, *Middlesex County(VA), Exurbanization, Interest groups, Community perceptions, Environmental hazards.

Rural areas of coastal Virginia face increased exurban development as the appeal of 'country' living, lower taxes, and better accessibility lead to rapid growth beyond the urban fringe. This study examined the potential social and environmental consequences of this trend in Middlesex County, Virginia. Since many portions of this county have high water tables and inefficient soils for wastewater treatment using conventional septic tank systems, future growth will create water pollution problems affecting not only the shellfishing industry but also human health. An alternative waste disposal method, such as centralized sewage systems, would likely lead to rapid population growth. A Delphi procedure is used to analyze interest group perceptions of local problems and prospects. Results indicate that most county representatives (1) want regulated growth to preserve existing land uses; (2) show wide range of understanding to wastewater treatment and its effects on future growth and (3) prefer to postpone any plans for central sewage facilities until local authorities have instituted growth-control ordinances.
W77-06400

ENVIRONMENTAL STABILITY AND FISH COMMUNITY DIVERSITY,
Everglades National Park, Homestead, Fla.
For primary bibliographic entry see Field 5C.
W77-06426

ENVIRONMENTAL STUDY OF THE DISPOSAL OF RED MUD WASTE,
Department of the Northern Territory, Darwin (Australia). Animal Industry and Agriculture Branch.
For primary bibliographic entry see Field 5E.
W77-06427

THE EFFECTS OF DREDGING ON WATER QUALITY IN THE NORTHWEST,
Environmental Protection Agency, Seattle, Wash. Region X.
For primary bibliographic entry see Field 5G.
W77-06535

SUPPLEMENT TO FINAL ENVIRONMENTAL STATEMENT; HARRY S. TRUMAN DAM AND RESERVOIR.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 6B.
W77-06538

APPENDIX A - AS ORDERED BY THE COURT TO THE SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT HARRY S. TRUMAN DAM AND RESERVOIR OSAGE RIVER, MISSOURI.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 6B.
W77-06539

7. RESOURCES DATA

7B. Data Acquisition

EVALUATION OF GAUZE PAD METHOD TO RECOVER VIRUSES FROM WATER,
Hadassah Medical School, Jerusalem (Israel).
For primary bibliographic entry see Field 5A.
W77-06183

A WATER-POWERED MECHANICAL DEVICE FOR ACCURATELY SUBSAMPLING LARGE NUMBERS OF NEKTONIC ORGANISMS,
Southwest Research Inst., Houston, Tex.
For primary bibliographic entry see Field 5A.
W77-06276

AN AUTOMATED RAPID SEDIMENT ANALYSER (ARSA),
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2J.
W77-06318

COMPARISON BETWEEN SIEVING AND SETTLING-TUBE DETERMINATIONS OF SAND SIZES BY USING DISCRIMINANT ANALYSIS,
Boston Univ., Mass. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W77-06319

ON THE OCEAN TEMPERATURE DISTRIBUTION IN THE GULF OF ALASKA, 1974-1975,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W77-06320

MONSOON RAINS OVER WEST AFRICA,
Freie Universitat, Berlin (West Germany), Institut Fuer Meteorologie.
For primary bibliographic entry see Field 2B.
W77-06322

METHODS FOR THE DETERMINATION OF INORGANIC CONSTITUENTS IN WATER,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-06338

STANDARD PROCEDURES FOR BIOLOGICAL EVALUATION.
Maine Dept. of Environmental Protection, Augusta. Div. of Lakes and Biological Studies.
For primary bibliographic entry see Field 5A.
W77-06374

SMALL MARINE ANIMAL COLLECTOR FOR USE BY DIVERS,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
M. R. Gilligan.
The Progressive Fish-Culturist, vol. 38, no. 1, p. 40-41, 1976. 2 fig.

Descriptors: *Design, *Research and development, *Sampling, Design criteria, Dimensions, Design data, Costs, Water pollution effects, On-site-investigations, *On-site-data collections, *Bottom sampling.
Identifiers: *Small marine animal collector, Divers, Collectors.

A hand-held piston device similar to a 'slurp gun' with a collecting bag attached was designed for collection of rocky shore fishes from small areas. Design, material costs, and construction method were given. The device was found to decrease specimen loss, reduce collecting time, ease specimen collection, and allow for large collections of specimens. (Katz)
W77-06419

PRECISION LIVE-FEEDER FOR FLOW-THROUGH LARVAL CULTURE OR FOOD CHAIN BIOASSAYS,
Environmental Research Lab., Gulf Breeze, Fla.
For primary bibliographic entry see Field 5A.
W77-06420

REARING SYSTEM FOR SMALL GROUPS OF EXPERIMENTAL FISH,
Fish and Wildlife Service, Beulah, Wyo. Fish Genetics Lab.
H. L. Kincaid, W. R. Bridges, and B. von Limbach.
The Progressive Fish-Culturist, Vol. 38, No. 1, p. 8-10, 1976; 4 fig, 3 ref.

Descriptors: *Design, *Research and development, *Equipment, Design criteria, Design data, Systems analysis, Engineering, Growth stages, Fry, *Methodology, *Aquiculture, Laboratory equipment, Laboratory animals, Salmonids, *Aquaria.
Identifiers: *Rearing system.

A rearing system for fry and fingerlings was developed and tested. Its advantages over similar systems were discussed. Design, construction and assembly of the system were described. The system is designed for small numbers of fish used for xperimental purposes. (Katz)
W77-06422

PORTABLE, HAND-OPERATED CYCLE SIEVE FOR WASHING MACROINVERTEBRATE SAMPLES,
National Environmental Research Center, Cincinnati, Ohio.
W. T. Mason, Jr.
The Progressive Fish-Culturist, Vol. 38, No. 1, p. 30-32, 1976; 3 fig, 5 ref.

Descriptors: *Research and development, *Design, *Equipment, Data collections, Invertebrates, Sampling, Dimensions, Design criteria, Design data, On-site-investigations, Water pollution effects.
Identifiers: *Sieves.

A light, portable cycle sieve with commercially available and easily assembled parts was described. The mechanism, design, and construction of the small boat sieve was presented. The sieve was designed for speeding the collection and analysis of macroinvertebrate samples, increasing sampling precision and reducing cost. (Katz)
W77-06424

PREFERRED TEMPERATURE OF FISH: A NEW METHOD,
Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering; and Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-06438

GEOTHERMAL ENERGY PUMP AND MONITOR SYSTEM,
Sperry Rand Corp., New York. (Assignee).
For primary bibliographic entry see Field 4B.
W77-06443

OIL SLICK SAMPLING APPARATUS AND METHOD,
Calspan Corp., Buffalo, N.Y. (Assignee).
For primary bibliographic entry see Field 5A.
W77-06444

COMBINED WATER METER AND PRESSURE REGULATOR,
Kaiser Aerospace and Electronics Corp., Oakland, Calif. (Assignee).
For primary bibliographic entry see Field 3D.
W77-06452

THE POLARIZATION CHARACTERISTICS OF LIDAR SCATTERING FROM SNOW AND ICE CRYSTALS IN THE ATMOSPHERE,
York Univ., Downview (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W77-06512

REMOTE SENSING OF THE THICKNESS AND COMPOSITION OF CIRRUS CLOUDS FROM SATELLITES,
Utah Univ., Salt Lake City. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W77-06513

SEASONAL AND WAVELENGTH DEPENDENCE OF URBAN/RURAL RADIANCE IN IOWA,
Iowa State Univ., Ames. Dept. of Aerospace Engineering; and Brooks, Borg and Skiles, Des Moines, Iowa.
B. K. Lunde.
Journal of Applied Meteorology, Vol. 16, No. 1, p 103-105, January 1977. 2 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Radiation, *Cities, *Rural areas, *Iowa, Satellites(Artificial), Albedo, Wavelengths, Heat budget, Snow cover, Seasonal, Energy, Energy budget.
Identifiers: *LANDSAT, Radiance variation.

LANDSAT measurements show that the radiance of urban areas is higher in the summer than that of rural areas and lower in the winter, aiding the heat budget of cities and tending to save energy. The radiance of both urban and rural areas increases with snow cover in winter, but cities have less radiance than the country. In the early summer the country has low radiance in the near infrared, and in the late summer it has low radiance in the visible region of the spectrum. The radiance of urban areas follows the mentioned trends in a very limited way. (Sims-ISWS)
W77-06514

NEARSHORE WAVE DIRECTION GAGE,
Geological Survey, Reston, Va. Conservation Div.
W. R. James, and R. J. Hallermeier.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW4, Proceedings Paper 12552, p 379-393, November 1976. 4 fig, 2 tab, 12 ref, 3 append.

Descriptors: *Waves(Water), *Ocean waves, *Shallow water, *Gaging, Instrumentation, Laboratory tests, Equipment, Measurement, Water level recorders, Water levels, Shores, Seashores, Beaches, Water levels, Coastal engineering, Oceanography, Automation.
Identifiers: *Wave direction measurement, Wave gaging.

Bow wave formation can cause large variation in peak water level around a thin circular pile in shallow-water waves. The symmetry of this variation might be used to measure wave direction on a crest-by-crest basis. This paper empirically examined the resolution possible in objectively estimating the symmetry point of data sets consisting of small numbers of peak-water-level measurements made around a pile in laboratory wave action. Data sets for several types of single incident crests, in wave action of steepness such that 0.007 equal to or less than H/l equal to or less than 0.05, were analyzed by three different estimation methods. For example, with 10 peak water level measurements (36 deg spacing around the pile), one estimation method gave directions within a range of 2.8 deg, on the average, for all test crests. The results indicate that four water-level sensors embedded in a vertical pile at 60 deg spacing might be used to measure the direction of single nearshore wave trains to a point within + or - 3 deg over a 120 deg range, in an instrument that can be made fully automatic. (See also W76-02399) (Humphreys-ISWS)
W77-06516

CALIFORNIA CURRENT EDDY FORMATION: SHIP, AIR, AND SATELLITE RESULTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-06523

USE OF SIDE-LOOKING AIRBORNE RADAR TO DETERMINE LAKE DEPTH ON THE ALASKAN NORTH SLOPE,
Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.
For primary bibliographic entry see Field 2H.
W77-06526

AN OPERATIONAL ALL-WEATHER GREAT LAKES ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 2C.
W77-06527

GREAT LAKES ALL-WEATHER ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 2C.
W77-06528

REMOTE SENSING OF SOIL MOISTURE WITH MICROWAVE RADIOMETERS-II,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
T. Schmugge, T. Wilheit, W. Webster, Jr., and P. Gloersen.
Report NASA TN D-8321, September 1976. 34 p, 20 fig, 7 tab, 25 ref.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, *Aircraft, Moisture content, Soil moisture meters, Soils, Soil properties, Soil texture, Surveys, Soil surveys, Vegetation, Vegetation effects, Radiation, Radio waves.
Identifiers: *Microwave radiometers.

Results were presented which were derived from measurements made by microwave radiometers during the March 1972 and February 1973 flights of National Aeronautics and Space Administration (NASA) Convair-990 aircraft over agricultural test sites in the southwestern part of United States. The purpose of the missions was to study the use of microwave radiometers for the remote sensing of soil moisture. The microwave radiometers covered the 0.8- to 21-cm wavelength range. The results showed a good linear correlation between the observed microwave brightness temperature and moisture content of the 0- to 1-cm layer of the soil. The results at the largest wavelength (21 cm) showed the greatest sensitivity to soil moisture variations and indicated the possibility of sensing these variations through a vegetative canopy. The effect of soil texture on the emission from the soil was also studied, and it was found that this effect can be compensated for by expressing soil moistures as a percent of field capacity for the soil. The results were compared with calculations based on a radiative transfer model for layered dielectrics, and the agreement is very good at the longer wavelengths. At the shorter wavelengths, surface roughness effects are larger, and the agreement becomes poorer. (Sims-ISWS)
W77-06530

7C. Evaluation, Processing and Publication

PROCESS CONTROL AND DATA PROCESSING IN SEWAGE TREATMENT PLANTS,
For primary bibliographic entry see Field 5D.
W77-06168

COMPUTER CONTROLS 55,000 CU M/DAY OF SEWAGE.
For primary bibliographic entry see Field 5D.
W77-06169

PHYSICAL AND ECONOMIC PARAMETERS FOR PLANNING REGIONAL WASTE WATER TREATMENT SYSTEMS,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W77-06171

ANALYSIS OF SNOW TEMPERATURE MEASUREMENTS (BASED ON DATA FOR THE WESTERN TIEN-SHAN),
For primary bibliographic entry see Field 2C.
W77-06303

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
Geological Survey Water-Data Report LA-76-1, December 1976. 463 p, 10 fig, 31 ref.

Descriptors: *Louisiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Streamflow, Flow rates, Gaging stations, Lakes, Reservoirs, Chemical analysis, Sediments, Water temperature, Sampling, Sites, Observation wells, Water levels, Water analysis.

Water resources data for the 1976 water year for Louisiana consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality for wells. This report for Central and Northern Louisiana contains discharge records for 52 gaging stations; stage only records for 33 gaging stations; water quality for 31 continuous, daily or bi-weekly stations, 30 miscellaneous stations, and 181 wells; and water levels for 320 observation wells. Also included are data for 60 crest-stage partial-record stations and 45 flood-profile partial-record stations. Additional water data were collected at 30 various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (Woodard-USGS)
W77-06326

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1976--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, La.
Water-Data Report LA-76-2, December 1976. 426 p, 14 fig, 31 ref.

Descriptors: *Louisiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Streamflow, Flow rates, Gaging stations, Lakes, Chemical analysis, Sediments, Water temperature, Sampling, Sites, Observation wells, Water levels, Water analysis.

Water resources data for the 1976 water year for Louisiana consists of records of stage discharge, and water quality of streams; water quality of lakes; and water levels and water quality for wells. This report for southern Louisiana contains discharge records for 22 gaging stations; stage only records for 12 gaging stations; water quality for 61 continuous, daily or bi-weekly stations, 240 miscellaneous stations, and 256 wells; and water levels for 387 observation wells. Also included are data for 31 crest-stage partial-record stations and 65 flood-profile partial-record stations. Additional water data were collected at 10 various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (Woodard-USGS)
W77-06327

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, SOUTHWEST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
P. J. Still.
Open-file report (basic data), 1976. 12 p, 1 fig, 1 tab.

Descriptors: *Water quality, *Basic data collections, *Surface waters, *Alaska, *Stations, Sampling, Sites, Streams, Lakes, Springs, Indexing, Data collections, Chemical analysis, Water temperature, Sediments, Biological properties, Maps.
Identifiers: Southwest Alaska.

This report includes a map showing the locations of all surface water quality sites in southwest Alaska, a table listing the types of data collected, and the periods of record to September 30, 1973. (Woodard-USGS)
W77-06328

INDEX OF SURFACE WATER QUALITY RECORDS TO SEPTEMBER 30, 1973, NORTHWEST AND ARCTIC SLOPE, ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
P. J. Still.
Open-file report (basic data), 1976. 9 p, 1 fig, 2 tab.

Descriptors: *Water quality, *Basic data collections, *Surface waters, *Alaska, *Stations, Sampling, Sites, Streams, Lakes, Springs, Indexing, Data collections, Chemical analysis, Water temperature, Sediments, Biological properties.
Identifiers: *Northwest and Arctic Slope(Alaska).

This report includes a map showing the locations of all surface water quality sites in Northwest and Arctic Slope, Alaska, a table listing the types of data collected, and the periods of record to September 30, 1973. (Woodard-USGS)
W77-06329

PROPOSED HYDROLOGIC ANALYSES OF STREAMFLOW FOR BRAZIL,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-06343

PESTICIDES DATA-COLLECTION ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY IN TEXAS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06344

MERCURY LEVELS IN THE RIVERS OF WESTERN CANADA 1970-1976.
Dept. of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5A.
W77-06363

DOCUMENTATION OF SELECTED CONSTRUCTS AND PARAMETER VALUES IN THE AQUATIC MODEL CLEANER,
Rensselaer Polytechnic Inst., Troy, N. Y.
For primary bibliographic entry see Field 5C.
W77-06381

EFFECTS OF STREAM CHANNEL IMPROVEMENTS ON DOWNSTREAM FLOODS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2A.
W77-06397

A NOTE ON VOLUMETRIC CONSIDERATIONS OF UPWELLING IN THE BENGUELA CURRENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2L.
W77-06504

ANNUAL AMOUNT OF PRECIPITATION IN THE USSR, ACCORDING TO CORRECTED DATA,
For primary bibliographic entry see Field 2B.
W77-06508

HYDROCHEMICAL DESCRIPTION OF THE GLACIERS OF THE CHIRCHIK RIVER BASIN,
For primary bibliographic entry see Field 2C.
W77-06510

AN OPERATIONAL ALL-WEATHER GREAT LAKES ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 2C.
W77-06527

GREAT LAKES ALL-WEATHER ICE INFORMATION SYSTEM,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
For primary bibliographic entry see Field 2C.
W77-06528

FLOOD PLAIN INFORMATION: SOUTHWEST FOOTHILL STREAMS (EVANS, THOMAS, AND WHITES CREEKS AND SKYLINE WASH), RENO, NEVADA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-06583

FLOOD PLAIN INFORMATION: REDWOOD RIVER AT MARSHALL, MINNESOTA.
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 4A.
W77-06584

FLOOD PLAIN INFORMATION: STONE, DARK AND KETTLE BROOKS, TOWN OF AUBURN, MASSACHUSETTS,
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-06585

FLOOD PLAIN INFORMATION: SACRAMENTO RIVER, ANDERSON AND OLINDA CREEKS, AND SPRING GULCH, ANDERSON, CALIFORNIA.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-06586

FLOOD PLAIN INFORMATION: WAHOO CREEK, COTTONWOOD CREEK, DRY RUN CREEK AND SAND CREEK, WAHOO, NEBRASKA,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-06587

FLOOD PLAIN INFORMATION: LITTLE SIOUX RIVER, OCHEYEDAN RIVER AND MUDDY CREEK, CITY OF SPENCER AND VICINITY, CLAY COUNTY, IOWA,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-06588

FLOOD PLAIN INFORMATION: WHITE RIVER - KILLBUCK CREEK, MADISON COUNTY AND ANDERSON, INDIANA,
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W77-06589

FLOOD PLAIN INFORMATION: OHIO RIVER, DEARBORN COUNTY, INDIANA.
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4A.
W77-06590

SPECIAL FLOOD HAZARD REPORT: SHIP CREEK, ALASKA.
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W77-06591

FLOOD PLAIN INFORMATION: SOUTH CREEK, NORTH CREEK, CATFISH CREEK, CLOWER CREEK, ELLIGRAW BAYOU AND MATHENY CREEK, SARASOTA COUNTY, FLORIDA.
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W77-06592

DISASTER ASSISTANCE (FLOOD MITIGATION).
NATO Committee on the Challenges of Modern Society, Brussels (Belgium).
For primary bibliographic entry see Field 4A.
W77-06593

8. ENGINEERING WORKS

8A. Structures

THE CALIFORNIA STATE WATER PROJECT SUMMARY: 1974.
California State Dept. of Water Resources, Sacramento.
Bulletin No 132-75, Append. C. 31 p. 26 fig, 6 tab.

Descriptors: *Hydraulic structures, *Water management(Applied), *Water distribution(Applied), *Multiple-purpose projects, *California, *Aqueducts, Dams, Impoundments, Facilities, Water conveyance, Water resources development, Pumping plants, Hydroelectric plants, Powerplants, Long-term planning, Legal aspects, Financing, Recreation, Construction, Administration, Water policy.
Identifiers: *California Aqueduct.

The progress to 1974, current status and future plans of California's Water Project, including the main line 444-mile state aqueduct, are summarized and reviewed, with reference made to specific actions concerning the project by the state's Department of Water Resources. These activities include project power, the long-range power program, the project water supply, studies to expand project benefits, storage of groundwater, recreation and fish and wildlife enhancement, a fishing access site program, and the California Aqueduct Bikeway. Construction progress is described for various project structures and facilities, and the Davis-Grunsky Act is described in relation to its implications for state financial assistance for water development. Long-term water supply contracts are reviewed and project operations for the year are compared with previous years' efforts. Summaries of operations are also given for each of 11 project lakes, reservoirs, pumping plants and diversion operations. Other materials include project financing data and physical plant statistics. (Harris-Wisconsin)
W77-06362

EXPERIENCE IN CONSTRUCTION OF A FROZEN-TYPE DAM IN YAKUTIYA,
G. A. Lyskanov.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-009 732, Price codes: A04 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 479, May 1975. 53 p, 14 fig, 19 ref. Translated from Opyt Stroitel'stva Plotiny Merzlogo Tipa v Yakutii, Yakutsk, Yakutskoye Knizhnoye Izdatel'stvo, 1964. 70 p.

Descriptors: *Dam construction, *Permafrost, *Cold regions, Dams, Spillways, Freezing, Foreign research, Foreign countries, Construction, Design, Dam design, Cold weather construction, Reservoirs, Reservoir operation, Temperature, Soils, Earthworks, Soil mechanics, Civil engineering.
Identifiers: *USSR(Yakutiya), *Frozen-type dams.

Dams presently constructed of permafrost were divided into two basic types: thawed and frozen. Frozen dams exclude filtration. Frozen dams are created by means of a special artificial cooling system, or they are made in the course of constructing the cores by laminar freezing. The formation of an ice core is also possible, with natural freezing of a dam erected from thawed soil. There are many dams on the collective farms of Yakutiya that were frozen during the period of operation. In winters, the reservoirs formed by these dams are completely or partially drained, converting the dams into piles of earth during this period, surrounded on three sides by cold air. This report investigated the characteristics of the construction of all types of frozen dams. (Sims-ISWS)
W77-06529

SUPPLEMENT TO FINAL ENVIRONMENTAL STATEMENT; HARRY S. TRUMAN DAM AND RESERVOIR.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 6B.
W77-06538

8B. Hydraulics

SIMPLIFIED ANALYSIS OF SURFACE BUOYANT JET,
Ontario Hydro, Toronto.
For primary bibliographic entry see Field 5B.
W77-06298

INDIRECT ESTIMATION OF HYDROLOGIC PARAMETERS,
Idrotecneco, Rome (Italy). Data and Systems Analysis Group.
For primary bibliographic entry see Field 2E.
W77-06300

INDUCED OSCILLATIONS OF LIQUID JET-GAS CAVITY SYSTEM,
Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering.
D. Rockwell.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY3, Proceedings Paper No. 12801, p 233-239, March 1977. 6 fig, 1 tab, 8 ref, 2 append.

Descriptors: *Jets, *Fluctuations, *Weirs, *Pressure, Hydrodynamics, Theoretical analysis, Continuity equation, Vibrations, Fluid mechanics, Velocity.
Identifiers: *Cavities, *Oscillations, *Pressure fluctuations, *Gas-liquid interaction, Weir nappes, Gravity flow.

Reported herein was an investigation of the basic liquid jet-gas cavity interaction, accounting for compressibility, frequency and amplitude of jet oscillation, and fall characterics of the undisturbed jet flow. Analysis revealed several new aspects of the liquid jet-gas cavity interaction: the phase angle between the jet origin and the cavity pressure fluctuation is a strong function of cavity compressibility and oscillation frequency; the amplitude of the cavity pressure fluctuation has resonance states which are related to phase angle and compressibility effects; and the phase angle dependence on frequency of oscillation has well-defined upper and lower limits due to cavity compressibility limits. (Admas-ISWS)
W77-06301

PROPERTIES OF CHANNEL WANDERING,
For primary bibliographic entry see Field 2E.
W77-06305

ENERGY RELATIONS OF DENSITY-CURRENT FLOWS: AN EXPERIMENTAL INVESTIGATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Institut.
For primary bibliographic entry see Field 2J.
W77-06317

HISTORY OF DREDGING AND FILLING OF LAGOONS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey, Fort Buchanan, Puerto Rico. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-06346

WAVE ENERGY POWER GENERATING BREAKWATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
L. E. Lesster, and R. Etkins.
U.S. Patent No. 3,989,951, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 952, No 1, p 387, November 2, 1976.

Descriptors: *Patents, *Waves(Water), *Breakwaters, *Energy, *Shore protection, Energy conversion, Electric power, Electric power production.

A breakwater apparatus for generating electrical power extracts energy from sea waves. An array of subsurface fixed-position flexible-walled pneumatic bags or cells, in a closed cycle system, react to surface-wave-correlated static presssure variations by expiring compressed gas into a supply header to a generator-driving pneumatic motor while simultaneously inspiring return gas in a return header from such motor. Alternate inspirational-expirational operation of individual cells involves use of a supply check valve at each cell, discharging into the supply header, and a return check valve at each cell, receiving from the return header. (Sinha-OEIS)
W77-06449

NONLINEAR FLOW OF WAVE CRESTS PAST A THIN PILE,
Coastal Engineering Research Center, Fort Belvoir, Va.
R. J. Hallermeier.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol. 102, No. WW4, Proceedings Paper 12551, p 365-377, November 1976. 5 fig, 1 tab, 27 ref, 3 append.

Descriptors: *Waves(Water), *Laboratory tests, *Coastal engineering, *High water mark, Analytical techniques, Hydraulic models, Hydraulics, Water levels, Measurement, Flow, Wave pile-up, Ocean waves, Surfaces, Energy, Height, Velocity.
Identifiers: *Nonlinear flow, Wave propagation, Piles.

The measured pattern of peak water line around a vertical circular pile in periodic wave action action can disagree with wave-scattering theory, showing a non-linear dependence on incident wave height when the pile radius is very small compared to the wavelength. The peak water line was measured around piles of several diameters in relatively shallow water with various incident laboratory waves. Features of the patterns indicate that a disturbance like a ship's bow wave forms during peak crest flow when a certain Froude number, incident crest velocity head divided by pile radius, becomes large, on the order of 0.1 to 1.0. The laboratory tests should reproduce basic flow effects in situations of coastal and ocean engineering interest, because field and laboratory situations have the same Froude number, implying geometric flow similarity. (See also W76-02399) (Humphreys-ISWS)
W77-06515

EFFECT OF TEMPERATURE ON CHANNEL RESISTANCE,
Riyad Univ., (Saudi Arabia). Dept. of Civil Engineering.
M. M. Abou-Seida, and F. Arafa.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY3, Proceedings Paper 12785, p 251-263, March 1977. 7 fig, 1 tab, 15 ref, 3 append.

Descriptors: *Alluvial channels, *Beds under water, *Temperature, Friction, Hydraulics, Resistance, Sediments, Sands, Viscosity, *Water temperature, Reynolds number, Open channel flow.
Identifiers: *Channel resistance.

The effect of the increase of water temperature on the resistance in alluvial channels was studied in a tilting flume 2.3 ft (0.7 m) in width. One kind of sand of median diameter D sub 50 = 0.00154 ft (0.47 mm) was used as bed material. Twelve runs divided into three main groups were carried out. For each group, the discharge and the depth were kept constant, while the temperature was increased in successive values. The equilibrium conditions for each temperature value were maintained by adjusting the slope of the flume. The minimum and maximum water temperature recorded were 58.1 F (14.5 C) and 122.9 F (50.5 C), respectively. Successive water temperature increases caused remarkable reductions in the total energy line slope, bed friction coefficient, and the friction coefficient associated with the bed forms. Their reduction depends on the Reynold's number of the bed and on the ratio between the water depth and the median diameter of the bed parti-

cles. The bed configuration at the highest water temperature tended to be nearly a flat bed covered with a layer of coarse grains. (Roberts-ISWS)
W77-06517

EFFECT OF BRANCH SPACING ON LOSSES FOR DIVIDING FLOW,
Worcester Polytechnic Inst., Mass. Dept. of Civil Engineering.
G. E. Hecker, J. B. Nystrom, and N. A. Qureshi.
Journal of the Hydraulic Division, American Society of Civil Engineers, Vol. 103, No. HY3, Proceedings Paper 12791, p 265-279, March 1977. 10 fig, 15 ref, 2 append.

Descriptors: *Head loss, *Discharge(Water), *Hydraulics, *Pipe flow, *Laboratory tests, Hydraulics, Energy equation, Discharge coefficient, Friction, Dimensional analysis, Equations.
Identifiers: *Manifolds, Loss coefficients, Form loss.

Tests were conducted to evaluate the effects of port spacing on head loss and discharge coefficients for dividing manifold flow. A branch geometry typical of an actual diffuser design was used, and the branch-to-main-pipe-diameter ratio and the relative spacing between branches were varied by increments. Evaluation of the test data for dividing flow indicated that the asymmetry of the velocity distribution in the main pipe downstream of a branch increased with decreasing branch spacing; the form loss coefficient for branch flow decreased with decreasing relative branch spacing; the form loss coefficient for through-flow in the main pipe increased with decreasing relative branch spacing; and the branch discharge coefficient increased with decreasing relative branch spacing. Although a particular geometry was used in the investigation, basic trends and percentage changes in the coefficients with the branch spacing may be generally applicable. (Singh-ISWS)
W77-06518

MEANDER SINUOSITY AND DIRECTION VARIANCE,
Hull Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-06521

STEPPED-BED MORPHOLOGY IN ARID GRAVELLY CHANNELS,
Ben Gurion Univ. of the Negev, Beersheva (Israel). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W77-06522

8C. Hydraulic Machinery

FLAME SPRAYING REDUCES PUMP LEAKAGE AT WASTE WATER TREATMENT PLANT.
Welding Journal, Vol. 55, No. 11, p 968, November, 1976. 2 fig.

Descriptors: *Pumps, Sludge, Waste water treatment, Hydraulic machinery, Treatment facilities, Economics, Solid wastes, Leakage, Sewerage, Mechanical equipment.
Identifiers: Flame spraying, Titanium dioxide, Pump sleeve ceramic coatings.

A ceramic coating on packing sleeves was used by the Metropolitan Sewer District of greater Cincinnati tc reduce pump leakage. A titanium dioxide ceramic was applied to pump sleeves by flame spraying. The process produces molten particles by feeding the titantium dioxide powder into the flame spraying gun. The coating, thus produced, is more resistant to abrasive/sewage sludge than the original metal. In five years of usage, there has been no failure. When the pumps in the system (stainless, bronze, or mild steel) develop excessive leakage, they are stripped down and the sleeves are rebuilt with the ceramic coating. This process has proven more economical than any other repair or replcement scheme. Proof of the effectiveness of the ceramic coating was shown a few years ago. Raw sludge-draw off pumps were installed to move solids from the settling tanks to the digesters. The new pump shaft sleeves began to wear excessively before the system was completed. The solution was the substitution of a water type lubricant for the pumps and rebuilding worn sleeves with the ceramic. (Collins-FIRL)
W77-06101

PRESSURIZED AIR SIMPLIFIES CONVEYING SEWAGE SOLIDS,
Neptune CPC Engineering Corp., Sturbridge, Mass. Pneumatic Ejector Div.
For primary bibliographic entry see Field 5D.
W77-06115

WAVE ENERGY POWER GENERATING BREAKWATER,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
For primary bibliographic entry see Field 8B.
W77-06449

8D. Soil Mechanics

EXPERIENCE IN CONSTRUCTION OF A FROZEN-TYPE DAM IN YAKUTIYA,
For primary bibliographic entry see Field 8A.
W77-06529

8E. Rock Mechanics and Geology

CONSTRUCTIONAL SHELF TOPOGRAPHY, DIAMOND SHOALS, NORTH CAROLINA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W77-06316

8G. Materials

SUCCESS IN GRP MOULDINGS THROUGH PRODUCT AND PROCESS DIVERSIFICATION.
European Plastics News, Vol. 3, No. 7 and 8, p 38-39, July/August, 1976.

Descriptors: *Sludge treatment, *Treatment facilities, *Pumps, *Sewage, *Materials, Equipment, Waste water treatment, Manholes, Plastics.
Identifiers: *Glass reinforced plastics molding.

The use of GRP molding at sludge handling facilities in Great Britain is described. Plastic materials are used in the production of tanks and silos as well as high pressure pump housings. Silo tanks for sewage farms are of the non-pressurized type and are produced in two semicircular section halves by the hand/spray lay-up technique using GRP molds. After molding, the two halves are bonded together and fitted with manhole covers, valves, and pipework. GRP is used in the form of hot press molded DMC to make the heavy section suction chamber and stator housing of high pressure, positive displacement pumps which are designed to handle liquids containing a high proportion of solids or fibrous materials. (Kreager-FIRL)
W77-06102

DESIGN SEWERS TO BE SELF-CLEANING,
A. S. Paintal.
Water and Wastes Engineering, Vol. 14, No. 1, p 32, 44-45, January, 1977. 6 fig, 9 ref.

Descriptors: *Sewerage, *Sanitary engineering, *Design criteria, *Design data, *Fluid mechanics, Solid wastes, Flow characteristics, Bacteria, Microorganisms, Biochemical oxygen demand, Temperature, Environmental control.
Identifiers: Self-cleaning sewers, Effective BOD, Boundary shear stress.

Hydrogen sulfide control and a self-cleaning capability can be designed into sewer systems. Design considerations include: flow characteristics, solids characteristics, BOD, sulfate contents, principles of fluid mechanics, sediment transport, and biochemical decomposition of solids. The self-cleaning aspects of sewers are dependent on tractive force generated by sewage flow on the sewer boundary. Hydrogen sulfide generation is important where microorganism activity is increased, as in warm climates. Sulfide generation depends upon sewage temperature and BOD, called effective BOD (EBOD). Hydrogen sulfide generation and buildup depend on the amount of sulfide reducing bacteria present. These bacteria breed in slime growth on the sewer boundary. Various equations and formulae are provided for making necessary design calculations with the above-mentioned criteria. Applicable design conditions evolved indicated the following: sanitary sewers should be essentially straight and circular in cross-section: flow should be uniform and describable by Manning's Formula; critical boundary shear stress should be the minimum which keeps sewage solids moving to reduce slime growth (0.08 pounds/square foot) and, at minimum flow, the mean value should be considered equal to the assumed critical shear stress. Pameroy's Z criteria can be used in sulfide control calculations. The slope necessary for self-cleaning sewers and sulfide control was calculated to be 0.00305 for a 2-foot diameter sewer. (Collins-FIRL)
W77-06103

SLUDGE TREATMENT SPECIALISTS.
For primary bibliographic entry see Field 05D.
W77-06132

AUSTENITIC STAINLESS STEELS AND TITANIUM FOR WET AIR OXIDATION OF SEWAGE SLUDGE,
Zimpro Inc., Rothschild, Wis.
For primary bibliographic entry see Field 05D.
W77-06145

8I. Fisheries Engineering

REARING SYSTEM FOR SMALL GROUPS OF EXPERIMENTAL FISH,
Fish and Wildlife Service, Beulah, Wyo. Fish Genetics Lab.
For primary bibliographic entry see Field 07B.
W77-06422

A STUDY ON THE INTENSIVE CARP CULTURE IN THE ARTIFICIALLY AERATED POND, (IN JAPANESE),
Y. Satomi, J. Toi, T. Ito, and H. Tanaka.
Bull Freshwater Fish Res Lab (Tokyo) 25(1), p 1-11, 1975.

Descriptors: *Aeration, *Carp, Fish stocking, Pumps, Nitrogen, Phosphorus, Dissolved oxygen, Fish harvest, Ponds.
Identifiers: *Aerated ponds, *Artificial aeration, *Aeration pumps.

Investigations were carried out with a high population density (1.2 kg/m2) of carp. An aeration pump (0.4 KW,25 m3h) was installed. The fish were fed on commercial pellets for 6 mo. At the end of the experiment the harvest carp was 2.3 kg.m2. More

than half of the N and P supplied was accumulated in the pond mud, and 18% of N and 16% of P were retained in the fish. The dissolved O2 contents and the NH4-N concentration in the pond water were in the normal range for fish growth during the experimental period; growth was inferior to that of carp in ordinary culture ponds. The retardation of fish growth in this case was caused by chronic effects of suspended soil colloid and/or NO2-N.
W77-06431

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W77-06143	5E	W77-06221	5D	W77-06299	5C	W77-06377	5C
W77-06144	5D	W77-06222	5D	W77-06300	2E	W77-06378	5G
W77-06145	5D	W77-06223	5D	W77-06301	8B	W77-06379	5B
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W77-06150	2D	W77-06228	5D	W77-06306	2H	W77-06384	5C
W77-06151	5D	W77-06229	5D	W77-06307	2B	W77-06385	5C
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W77-06161	5A	W77-06239	5B	W77-06317	2J	W77-06395	5B
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W77-06168	5D	W77-06246	4B	W77-06324	5B	W77-06402	5C
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W77-06170	5D	W77-06248	3B	W77-06326	7C	W77-06404	5C
W77-06171	5D	W77-06249	3C	W77-06327	7C	W77-06405	5C
W77-06172	5G	W77-06250	5D	W77-06328	7C	W77-06406	2I
W77-06173	5B	W77-06251	5A	W77-06329	7C	W77-06407	5C
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ABSTRACT SOURCES

SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
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C. OTHER		
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C. OTHER (CONTINUED)		
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